working level, the calculated maximum stress during test shall not exceed 90 percent of the yield strength of the material at test temperature. The supporting structure shall be analyzed to verify its adequacy.

(b) In all cases where the tanks are mechanically stress relieved in place in the ship or barge and the tanks are designed to carry cargoes with a specific gravity less than 1.05, the ship or barge shall be shown to have adequate stability and buoyancy, as well as strength to carry the excess weight of the tank during the stress relief procedure.

PART 56—PIPING SYSTEMS AND APPURTENANCES

Subpart 56.01—General

Sec.

Subpart 56.04—Piping Classification

Subpart 56.07—Design

Subpart 56.10—Components

Subpart 56.15—Fittings

Subpart 56.20—Valves

Subpart 56.25—Pipe Flanges, Blanks, Flange Facings, Gaskets, and Bolting

Subpart 56.30—Selection and Limitations of Piping Joints

Subpart 56.35—Expansion, Flexibility and Supports

Subpart 56.50—Design Requirements Pertaining to Specific Systems

Subpart 56.60—Materials

Subpart 56.65—Fabrication, Assembly and Erection

Subpart 56.70—Welding

Subpart 56.75—Brazing

Subpart 56.80—Bending and Forming

Subpart 56.85—Heat Treatment of Welds

Subpart 56.90—Assembly

Subpart 56.95—Inspection

Subpart 56.97—Pressure Tests

AUTHORITY: 33 U.S.C. 1321(j), 1509; 43 U.S.C. 1333; 46 U.S.C. 3306, 3703; E.O. 12234, 45 FR 58801, 3 CFR, 1980 Comp., p. 277; E.O. 12777, 56 FR 54757, 3 CFR, 1991 Comp., p. 351; Department of Homeland Security Delegation No. 0170.1.

SOURCE: CGFR 68–82, 33 FR 18843, Dec. 18, 1968, unless otherwise noted.

Subpart 56.01—General

NOTE: See §50.15–10 for general adoption of standards of the ANSI (American National Standards Institute). The printing of portions of the "American National Standard Code for Pressure Piping, Power Piping," ANSI–B31.1, is with the permission of the publisher, The American Society of Mechanical Engineers (ASME) International, Three Park Avenue, New York, N.Y. 10016—5990. The adoption of this standard ANSI–B31.1 for pressure piping and power piping is subject to specific limitations or modifications as described in this part. Those requirements in ANSI–B31.1 which are not referred to in this part are adopted without change. Table 56.01–5(a) sets forth a general reference to various paragraphs in ANSI–B31.1 which are limited, modified, or replaced by regulations in this part.

§56.01–1 Scope (replaces 100.1).

(a) This part contains requirements for the various ships' and barges' piping systems and appurtenances.

(b) The respective piping systems installed on ships and barges shall have the necessary pumps, valves, regulation valves, safety valves, relief valves, flanges, fittings, pressure gages, liquid level indicators, thermometers, etc., for safe and efficient operation of the vessel.

(c) Piping for industrial systems on mobile offshore drilling units need not fully comply with the requirements of

this part but must meet Subpart 58.60 of this subchapter.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 73–251, 43 FR 56799, Dec. 4, 1978]

§ 56.01–2 Incorporation by reference.

(a) Certain standards and specifications are incorporated by reference into this part with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a). To enforce any edition other than the one listed in paragraph (b) of this section, notice of the change must be published in the FEDERAL REGISTER and the material made available to the public. All approved material is available from the sources indicated in paragraph (b) or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.*

(b) The standards and specifications approved for incorporation by reference in this part, and the sections affected are:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

11 West 42nd Street, New York, NY 10036

ANSI B1.1–82 Unified Inch Screw Threads (UN and UNR Thread Form) 56.60–1; 56.25–20
ANSI B1.20.1–83 Pipe Threads, General Purpose (Inch) 56.60–1
ANSI B1.20.3–76 (reaffirmed 1982) Dryseal Pipe Threads (Inch) 56.60–1
ANSI B16.1–75 Cast Iron Flanges and Flanged Fittings, Class 25, 125, 250 and 800 .....56.60–1; 56.60–10
ANSI B16.3–85 Malleable Iron Threaded Fittings, Classes 150 and 300 .....56.60–1
ANSI B16.4–85 Cast Iron Threaded Fittings, Classes 125 and 250 .....56.60–1
ANSI B16.5–81 Pipe Flanges and Flanged Fittings ...56.25–20; 56.30–10; 56.60–1
ANSI B16.9–86 Factory-Made Wrought Steel Buttwelding Fittings.....56.60–1
ANSI B16.10–86 Face-to-Face and End-to-End Dimensions of Ferrous Valves 56.60–1
ANSI B16.11–80 Forged Steel Fittings, Socket-Welding and Threaded 56.30–5; 56.60–1
ANSI B16.14–83 Ferrous Pipe Plugs, Bushings, and Locknuts with Pipe Threads 56.60–1
ANSI B16.15–85 Cast Bronze Threaded Fittings, Classes 125 and 250 .....56.60–1
ANSI B16.18–84 Cast Copper Alloy Solder Joint Pressure Fittings 56.60–1
ANSI B16.20–73 Ring-Joint Gaskets and Grooves for Steel Pipe Flanges
VIII, Division 1, Pressure Vessels, 1986 with addenda 56.15–1; 56.15–5; 56.15–10; 56.25–5; 56.30–10; 56.30–30; 56.60–15; 56.60–1; 56.95–10
Section IX, Welding and Brazing Qualifications, 1986 with addenda 56.70–5; 56.70–20; 56.75–20; 56.0–1
ANSI B16.24–79 Bronze Pipe Flanges and Flanged Fittings, Class 150 and 300 .....56.60–1
ANSI B16.25–86 Buttwelding Ends 56.60–1; 56.30–5; 56.70–10
ANSI B16.28–86 Wrought Steel Buttwelding Short Radius Elbows and Returns 56.60–1
ANSI B16.29–86 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings—DWV.....56.60–1
ANSI B16.34–88 Valves-Flanged, Threaded and Welding End...56.20–1; 56.60–1
ANSI B16.42–87 Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300 .....56.60–1
ANSI B18.2.1–81 Square and Hex Bolts and Screws, Inch Series.....56.25–20; 56.60–1
ANSI B18.2.2–87 Square and Hex Nuts 56.25–20; 56.60–1
ANSI B31.1–86 Power Piping 56.01–5
ANSI B36.10M–85 Welded and Seamless Wrought Steel Pipe 56.07–5; 56.30–20; 56.60–1
ANSI B36.19M–85 Stainless Steel Pipe 56.07–5; 56.60–1

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) INTERNATIONAL

Three Park Avenue, New York, NY 10016—5990

Boiler and Pressure Vessel Code:

Section I, Power Boilers, 1986 with addenda56.15–5; 56.15–10; 56.60–1; 56.60–1; 56.70–15; 56.95–10 56.15–1
Section VIII, Division 1, Pressure Vessels, 1986 with addenda ...56.15–1; 56.15–5; 56.15–10; 56.25–5; 56.30–10; 56.30–30; 56.60–15; 56.60–1; 56.95–10
Section IX, Welding and Brazing Qualifications, 1986 with addenda 56.70–5; 56.70–20; 56.75–20; 56.85–10

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

100 Barr Harbor Drive, West Conshohocken, PA 19428–2959.

ASTM A 36/A 36M–97a, Standard Specification for Carbon Structural Steel 56.30–10

SP–53–85 Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components—Magnetic Particle Examination Method 56.60–1
SP–55–85 Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components—Visual Method.....56.60–1
SP–58–83 Pipe Hangers and Supports—Materials, Design and Manufacture.....56.60–1
SP–61–85 Pressure Testing of Steel Valves.....56.60–1
SP–67–83 Butterfly Valves.....56.60–1
SP–69–83 Pipe Hangers and Supports—Selection and Application 56.60–1
SP–72–87 Ball Valves with Flanged or Butt-Welding Ends for General Service.....56.60–1
SP–73–86 Brazing Joints for Wrought and Cast Copper Alloy Solder Joint Pressure Fittings 56.60–1
SP–83–87 Steel Pipe Unions, Socket-Welding and Threaded 56.60–1

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

400 Commonwealth Drive, Warrendale, Pa 15096

J1475–84 Hydraulic Hose Fittings for Marine Applications.....56.60–25
J1942–89 Hose and Hose Assemblies for Marine Applications.....56.60–25

[CGD 77–140, 54 FR 40599, Oct. 2, 1989; 55 FR 39968, Oct. 1, 1990, as amended by CGD 88–032, 56 FR 35822, July 29, 1991; CGD 95–012, 60 FR 48049, Sept. 18, 1995; CGD 95–027, 61 FR 26000, May 23, 1996; CGD 96–041, 61 FR 50728, Sept. 27, 1996; CGD 97–057, 62 FR 51044, Sept. 30, 1997; CGD 95–028, 62 FR 51200, Sept. 30, 1997; USCG–1999–6216, 64 FR 53224, Oct. 1, 1999; USCG–1999–5151, 64 FR 67178, Dec. 1, 1999; USCG–2004–18884, 69 FR 58346, Sept. 30, 2004]

§ 56.01–3 Power boiler external piping (Replaces 100.1.1, 100.1.2, 111.6, 122.1, 132 and 133).

(a) Power boiler external piping and components must meet the requirements of this part and §§ 52.01–105, 52.01–110, 52.01–115, and 52.01–120 of this chapter.

(b) Specific requirements for power boiler external piping and appurtenances, as defined in §§ 100.1.1 and 100.1.2, appearing in the various paragraphs of ANSI B31.1, are not adopted unless specifically indicated elsewhere in this part.

[CGD 77–140, 54 FR 40602, Oct. 2, 1989; 55 FR 39968, Oct. 1, 1990]

§ 56.01–5 Adoption of ANSI (American National Standards Institute) Code B31.1 for pressure and power piping, and other standards.

(a) Piping systems for ships and barges shall be designed, constructed, and inspected in accordance with B31.1, the "Code for Pressure Piping, Power Piping," of the ANSI (American National Standards Institute), as limited, modified, or replaced by specific requirements in this part. The provisions in the appendices to ANSI–B31.1 are adopted and shall be followed when the requirements in ANSI–B31.1 or the regulations in this part make them mandatory. For general information Table 56.01–5(a) lists the various paragraphs, etc., in ANSI–B31.1 which are limited, modified, replaced, or reproduced by regulations in this part.

TABLE 56.01–5(A)—LIMITATIONS AND MODIFICATIONS IN THE ADOPTION OF ANSI–B31.1 CODE FOR PRESSURE AND POWER PIPING

Section or paragraph in ANSI–B31.1, and disposition	Unit in this part
100.1 replaced by	56.01–1.
100.2 modified by	56.07–5.
101 through 104.7 modified by	56.07–10.
101.2 modified by	56.07–10(a), (b).
101.5 replaced by	56.07–10(c).
102.2 modified by	56.07–10(d).
102.2.5(d) replaced by	56.50–40.
102.3 and 104.1.2 modified by	56.07–10(e).
104.3 modified by	56.07–10(f).
104.4 modified by	56.07–10(e).
104.5.1 modified by	56.30–10.
105 through 108 replaced by	56.10–1 through 56.25–20.
110 through 118 replaced by	56.30–1 through 56.30–35.
119.5.1 replaced by	56.35–10, 56.35–15, 56.35–35.
119.7 replaced by	56.35–1.
122.3 modified by	56.50–97.
122.6 through 122.10 replaced by	56.50–1 through 56.50–80.
123 replaced by	56.60–1.
Table 126.1 is replaced by	56.30–5(c)(3), 56.60–1.
127 through 135.4 replaced by	56.65–1, 56.70–1 through 56.90–10.
136 replaced by	56.95–1 through 56.95–10.
137 replaced by	56.97–1 through 56.97–40.

(b) When a section or paragraph of the regulations in this part relates to material in ANSI–B31.1 Code (American National Standard Code for Pressure Piping, Power Piping), the relationship with this code will be shown immediately following the heading of the

section or at the beginning of the paragraph as follows:

(1) (Modifies _____.) This indicates that the material in the ANSI–B31.1 so numbered for identification is generally applicable but is being altered, amplified or augmented.

(2) (Replaces _____.) This indicates that the material in the ANSI–B31.1 so numbered for identification does not apply.

(3) (Reproduces _____.) This indicates that the material in the ANSI–B31.1 so numbered for identification is being identically reproduced for convenience, not for emphasis.

(c) As stated in §50.15–10 of this chapter, the standards of the ANSI (American National Standards Institute) specifically referred to in this part shall be the governing requirements for the subject matters covered unless specifically limited, modified or replaced by other regulations in this subchapter. See §56.60–1(b) for the other adopted commercial standards applicable to piping systems which also form a part of this subchapter.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGFR 72–59R, 37 FR 6189, Mar. 25, 1972; CGD 73–254, 40 FR 40164, Sept. 2, 1975; CGD 77–140, 54 FR 40602, Oct. 2, 1989]

§56.01–10 Plan approval.

(a) Plans and specifications for new construction and major alterations showing the respective piping systems shall be submitted, as required by subpart 50.20 of this subchapter.

(b) Piping materials and appliances, such as pipe, tubing, fittings, flanges, and valves, except safety valves and safety relief valves covered in part 162 of subchapter Q (Specifications) of this chapter, are not required to be specifically approved by the Commandant, but shall comply with the applicable requirements for materials, construction, markings, and testing. These materials and appliances shall be certified as described in part 50 of this subchapter. Drawings listing material specifications and showing details of welded joints for pressure-containing appurtenances of welded construction shall be submitted in accordance with paragraph (a) of this section.

(c)(1) Prior to installation aboard ship, diagrams of the following systems shall be submitted for approval:

(i) Steam and exhaust piping.

(ii) Boiler feed and blowoff piping.

(iii) Safety valve escape piping.

(iv) Fuel oil service, transfer and filling piping. (Service includes boiler fuel and internal combustion engine fuel piping.)

(v) Fire extinguishing systems including fire main and sprinkler piping, inert gas and foam.

(vi) Bilge and ballast piping.

(vii) Tank cleaning piping.

(viii) Condenser circulating water piping.

(ix) Vent, sound and overflow piping.

(x) Sanitary drains, soil drains, deck drains, and overboard discharge piping.

(xi) Internal combustion engine exhaust piping. (Refer to part 58 of this subchapter for requirements.)

(xii) Cargo piping.

(xiii) Hot water heating systems if the temperature is greater than 121 °C(250 °F).

(xiv) Compressed air piping.

(xv) Fluid power and control systems (hydraulic, pneumatic). (Refer to subpart 58.30 of this subchapter for specific requirements.)

(xvi) Lubricating oil piping.

(xvii) Refrigeration and air conditioning piping. (Refer to part 58 of this subchapter for specific requirements.)

(2) Arrangement drawings of the following systems shall also be submitted prior to installation:

(i) All Classes I, I–L, and II–L systems.

(ii) All Class II firemain, foam, sprinkler, bilge and ballast, vent sounding and overflow systems.

(iii) Other Class II systems only if specifically requested or required by regulations in this subchapter.

(d)(1) The drawings or diagrams shall include a list of material, furnishing pipe diameters, wall thicknesses, design pressure, fluid temperature, applicable ASTM material or ANSI component specification, type, size, design standard, and rating of valves, flanges, and fittings.

(2) Pump rated capacity and pump shutoff head shall appear on piping diagrams. Pump characteristic curves shall be submitted for all pumps in the

firemain and foam systems. These curves need not be submitted if the following information is shown on the drawing:

(i) Rated capacity and head at rated capacity.

(ii) Shutoff head.

(iii) Head at 150 percent rated capacity.

(3) Standard drawings of the following fabrication details shall be submitted:

(i) Welding details for piping connections.

(ii) Welding details for nonstandard fittings (when appropriate).

(d–1) Plans of piping for industrial systems on mobile offshore drilling units must be submitted under subpart 58.60 of this subchapter.

(e) Where piping passes through watertight bulkheads and/or fire boundaries, plans of typical details of piping penetrations shall be submitted.

(f) Arrangement drawings specified in paragraph (c)(2) of this section are not required if—

(1) The location of each component for which there is a location requirement (i.e., shell penetration, fire station, foam monitor, etc.) is indicated on the piping diagram;

(2) The diagram includes, or is accompanied by and makes reference to, a material schedule which describes components in sufficient detail to substantiate their compliance with the regulations of this subchapter;

(3) A thermal stress analysis is not required; and

(4) A dynamic analysis is neither required nor elected in lieu of allowable stress reduction.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGFR 72–59R, 37 FR 6189, Mar. 25, 1972; CGD 73–251, 43 FR 56799, Dec. 4, 1978, CGD 77–140, 54 FR 40602, Oct. 2, 1989; CGD 95–012, 60 FR 48049, Sept. 18, 1995]

Subpart 56.04—Piping Classification

§ 56.04–1 Scope.

Piping shall be classified as shown in Table 56.04–1.

TABLE 56.04–1—PIPING CLASSIFICATIONS

Service	Class	Section in this part
Normal	I, II	56.04–2
Low temperature	I–L, II–L	56.50–105

[CGD 72–206R, 38 FR 17229, June 29, 1973, as amended by CGD 77–140, 54 FR 40602, Oct. 2, 1989; CGD 95–012, 60 FR 48049, Sept. 18, 1995]

§ 56.04–2 Piping classification according to service.

The designation of classes according to service is found in Table 56.04–2.

TABLE 56.04–2—PRESSURE PIPING CLASSIFICATION

Service	Class [1]	Pressure (p.s.i.g.)		Temp. (°F)
Class B and C poisons [2]	I	any	and	0 and above.
	I–L	any	and	below 0.
	II	([3])	([3])	([3])
	II–L	([3])	([3])	([3])
Gases and vapors [2]	I	above 150	or	above 650.
	I–L	above 150	and	below 0.
	II	150 and below	and	0 to 650.
	II–L	150 and below	and	below 0.
Liquefied flammable gases [2]	I	above 150	and	0 and above. [1]
	I–L	above 150	and	below 0.
	II	150 and below	and	0 and above.
	II–L	150 and below	and	below 0.
Molten sulphur	I	above 225	or	above 330.
	II	225 and below	and	330 and below.
Cargo liquids Grades A through D [2]	I	above 225	or	above 150.
	I–L	above 225	and	below 0.
	II	225 and below	and	0 to 150.
	II–L	225 and below	and	below 0.
Cargo liquids Grade E	I	above 225	or	above 400.
	I–L	above 225	and	below 0.
	II	225 and below	and	0 to 400.
	II–L	225 and below	and	below 0.

TABLE 56.04–2—PRESSURE PIPING CLASSIFICATION—Continued

Service	Class [1]	Pressure (p.s.i.g.)		Temp. (°F)
Water	I	above 225	or	above 350.
	II	225 and below	and	350 and below.
Fuels (Bunker, diesel, gasoline, etc.)	I	above 150	or	above 150.
	II	150 and below	and	150 and below.
Lubricating oil	I	above 225	or	above 400.
	II	225 and below	and	400 and below.
Asphalt	I	above 225	or	above 400.
	II	225 and below	and	400 and below.
Heat transfer oil	I	above 225	or	above 400.
	II	225 and below	and	400 and below.
Hydraulic fluid	I	above 225	or	above 400.
	II	225 and below	and	400 and below.
Flammable or combustible dangerous cargoes.	Refer to specific requirements of part 40 of this chapter.			
Other dangerous cargoes.	Refer to specific requirements of part 98 of this chapter.			

[1] Where doubt exists as to proper classification, refer to the Commandant for resolution.
[2] For definitions, see 46 CFR parts 30, 151, and 154. Note that the category "B and C" poisons is not used in the rules applying to self-propelled vessels (46 CFR part 153).
[3] Not permitted except inside cargo tanks approved for Class B and C poisons.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 73–254, 40 FR 40164, Sept. 2, 1975; CGD 73–96, 42 FR 49024, Sept. 26, 1977]

§ 56.04–10 Other systems.

Piping systems and appurtenances not requiring plan approval may be accepted by the marine inspector if:

(a) The system is suitable for the service intended,

(b) There are guards, shields, insulation and similar devices where needed for protection of personnel,

(c) Failure of the systems would not hazard the vessel, personnel or vital systems, and

(d) The system is not manifestly unsafe.

[CGD 77–140, 54 FR 40602, Oct. 2, 1989]

Subpart 56.07—Design

§ 56.07–5 Definitions (modifies 100.2).

(a) *Piping.* The definitions contained in 100.2 of ANSI–B31.1 apply, as well as the following:

(1) The word *piping* within the meaning of the regulations in this subchapter refers to fabricated pipes or tubes with flanges and fittings attached, for use in the conveyance of vapors, gases or liquids, regardless of whether the diameter is measured on the inside or the outside.

(b) *Nominal diameter.* The term *nominal diameter* or *diameter* as used in this part, means the commercial diameter of the piping, i.e., pipe size.

(c) *Schedule.* The word *Schedule* when used in this part refers to specific values as given in American National Standards B36.10 and B36.19.

(d) *Fittings and appurtenances.* The word *fitting* and the phrase *fittings and appurtenances* within the meaning of the regulations in this subchapter refer to pressure containing piping system components other than valves and pipe. This includes piping system components whose function is to join branches of the system (such as tees, wyes, elbows, unions, bushings, etc.) which are referred to as pipe joining fittings, as well as components which operate on the fluid contained in the system (such as traps, drains, strainers, separators, filters, meters, etc.), which are referred to as "fluid conditioner" fittings. Thermometer wells and other similar fittings which form part of the pressure barrier of any system are included under this heading. Expansion joints, slip joints, rotary joints, quick disconnect couplings, etc., are referred to as special purpose fittings, and may be subject to such special design and testing requirements as prescribed by the Commandant. Refer to subpart 56.15 for design requirements for fittings.

(e) *Nonstandard fittings.* "Nonstandard fitting" means a component of a piping system which is not fabricated under an adopted industry standard.

(f) *Vital system.* A *vital system* is one which is essential to the safety of the vessel, its passengers and crew.

(g) *Plate flange.* The term *plate flange,* as used in this subchapter, means a flange made from plate material, and may have a raised face and/or a raised hub.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 77–140, 54 FR 40602, Oct. 2, 1989]

§56.07–10 Design conditions and criteria (modifies 101–104.7).

(a) *Maximum allowable working pressure* (*modifies 101.2*). (1) The maximum allowable working pressure of a piping system shall not be greater than the internal design pressure defined in 104.1.2 of ANSI–B31.1.

(2) Where the maximum allowable working pressure of a system component, such as a valve or a fitting, is less than that computed for the pipe or tubing, the system pressure shall be limited to the lowest of the component maximum allowable working pressures.

(b) *Relief valves* (*modifies 101.2*). (1) Every system which may be exposed to pressures higher than the system's maximum allowable working pressure shall be safeguarded by appropriate relief devices. (See §52.01–3 of this subchapter for definitions.) Relief valves are required at pump discharges except for centrifugal pumps so designed and applied that a pressure in excess of the maximum allowable working pressure for the system cannot be developed.

(2) The relief valve setting shall not exceed the maximum allowable working pressure of the system. Its relieving capacity shall be sufficient to prevent the pressure from rising more than 20 percent above the system maximum allowable working pressure. The rated relieving capacity of safety and relief valves used in the protection of piping systems only shall be based on actual flow test data and the capacity shall be certified by the manufacturer at 120 percent of the set pressure of the valve.

(3) Relief valves shall be certified as required in part 50 of this subchapter for valves, and shall also meet the requirements of §54.15–10 of this subchapter.

(c) *Ship motion dynamic effects* (*replaces 101.5.3*). Piping system designs shall account for the effects of ship motion and flexure, including weight, yaw, sway, roll, pitch, heave, and vibration.

(d) *Pressure temperature ratings* (*modifies 102.2*). The material in 102.2 of ANSI–B31.1 is applicable with the following exceptions:

(1) The details of components not having specific ratings as described in 102.2.2 of ANSI B31.1 must be furnished to the Marine Safety Center for approval.

(2) Boiler blowoff piping must be designed in accordance with §56.50–40 of this part.

(e) *Pressure design* (*modifies 102.3, 104.1.2 and 104.4*). (1) Materials for use in piping must be selected as described in §56.60–1(a) of this part. Tabulated allowable stress values for these materials shall be measured as indicated in 102.3.1 of ANSI–B–31.1, Tables 56.60–1 and 56.60–2(a).

(2) Allowable stress values, as found in the ASME Code, which are restricted in application by footnote or are italicized shall not be used. Where multiple stresses are listed for a material, the lowest value of the listing shall be used unless otherwise approved by the Commandant. In all cases the temperature is understood to be the actual temperature of the component.

(3) Where the operator desires to use a material not listed, permission must be obtained from the Commandant. Requirements for testing found in §56.97–40(a)(2) and §56.97–40(a)(4) may affect design and should be considered. Special design limitations may be found for specific systems. Refer to subpart 56.50 for specific requirements.

(f) *Intersections* (*modifies 104.3*). The material of ANSI–B31.1 in 104.3 is applicable with the following additions:

(1) Reinforcement calculations where applicable shall be submitted.

(2) Wherever possible the longitudinal joint of a welded pipe should not be pierced.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; 37 FR 16803, Aug. 19, 1972; CGD 73–254, 40 FR 40164, Sept. 2, 1975; CGD 77–140, 54 FR 40602, Oct. 2, 1989; CGD 95–012, 60 FR 48050, Sept. 18, 1995; CGD 95–028 62 FR 51200, Sept. 30, 1997; USCG–1998–4442, 63 FR 52190, Sept. 30, 1998]

Subpart 56.10—Components

§ 56.10–1 Selection and limitations of piping components (replaces 105 through 108).

(a) Pipe, tubing, pipe joining fittings, and piping system components, shall meet material and standard requirements of subpart 56.60 and shall meet the certification requirements of part 50 of this subchapter.

(b) The requirements in this subpart and subparts 56.15 through 56.25 shall be followed in lieu of those in 105 through 108 in ANSI–B31.1; however, certain requirements are marked "reproduced."

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970]

§ 56.10–5 Pipe.

(a) *General.* Pipe and tubing shall be selected as described in Table 56.60–1(a).

(b) *Ferrous pipe.* ASTM Specification A 53 (incorporated by reference, see § 56.01–2) furnace welded pipe shall not be used for combustible or flammable liquids within machinery spaces. (See §§ 30.10–15 and 30.10–22 of this chapter.)

(c) *Nonferrous pipe.* (See also § 56.60–20.) (1) Copper and brass pipe for water and steam service may be used for design pressures up to 250 pounds per square inch and for design temperatures to 406 °F.

(2) Copper and brass pipe for air may be used in accordance with the allowable stresses found from Table 56.60–1(a).

(2–a) Copper-nickel alloys may be used for water and steam service within the design stress and temperature limitations indicated in ANSI–B31.1.

(3) Copper tubing may be used for dead-end instrument service up to 1,000 pounds per square inch.

(4) Copper, brass, or aluminum pipe or tube shall not be used for flammable fluids except where specifically permitted by this part.

(5) Aluminum alloy pipe or tube may be used within the limitation stated in 123.2.7 of ANSI–B31.1 and paragraph (4) of this section (c)5.

(d) *Nonmetallic pipe.* Plastic pipe may be used subject to the conditions described in § 56.60–25.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGFR 72–59R, 37 FR 6189, Mar. 25, 1972; CGD 77–140, 54 FR 40602, Oct. 2, 1989; CGD 95–028, 62 FR 51200, Sept. 30, 1997; USCG–2000–7790, 65 FR 58460, Sept. 29, 2000]

Subpart 56.15—Fittings

SOURCE: CGD 77–140, 54 FR 40602, Oct. 2, 1989, unless otherwise noted.

§ 56.15–1 Pipe joining fittings.

(a) Pipe joining fittings certified in accordance with subpart 50.25 of this subchapter are acceptable for use in piping systems.

(b) Threaded, flanged, socket-welding, buttwelding, and socket-brazing pipe joining fittings, made in accordance with the applicable standards in Tables 56.60–1(a) and 56.60–1(b) of this part and of materials complying with subpart 56.60 of this part, may be used in piping systems within the material, size, pressure, and temperature limitations of those standards and within any further limitations specified in this subchapter. Fittings must be designed for the maximum pressure to which they may be subjected, but in no case less than 50 pounds per square inch gage.

(c) Pipe joining fittings not accepted for use in piping systems in accordance with paragraph (b) of this section must meet the following:

(1) All pressure-containing materials must be accepted in accordance with § 56.60–1 of this part.

(2) Fittings must be designed so that the maximum allowable working pressure does not exceed one-fourth of the burst pressure or produce a primary stress greater than one-fourth of the

ultimate tensile strength of the material for Class II systems and for all Class I, I–L, and II–L systems receiving ship motion dynamic analysis and nondestructive examination. For Class I, I–L, or II–L systems not receiving ship motion dynamic analysis and nondestructive examination under §56.07–10(c) of this part, the maximum allowable working pressure must not exceed one-fifth of the burst pressure or produce a primary stress greater than one-fifth of the ultimate tensile strength of the material. The maximum allowable working pressure may be determined by—

(i) Calculations comparable to those of ANSI B31.1 or Section VIII of the ASME Code;

(ii) Subjecting a representative model to a proof test or experimental stress analysis described in paragraph A–22 of Section I of the ASME Code; or

(iii) Other means specifically accepted by the Marine Safety Center.

(3) Fittings must be tested in accordance with §56.97–5 of this part.

(4) If welded, fittings must be welded in accordance with subpart 56.70 of this part and part 57 of this chapter or by other processes specifically approved by the Marine Safety Center. In addition, for fittings to be accepted for use in piping systems in accordance with this paragraph, the following requirements must be met:

(i) For fittings sized three inches and below—

(A) The longitudinal joints must be fabricated by either gas or arc welding;

(B) One fitting of each size from each lot of 100 or fraction thereof must be flattened cold until the opposite walls meet without the weld developing any cracks;

(C) One fitting of each size from each lot of 100 or fraction thereof must be hydrostatically tested to the pressure required for a seamless drawn pipe of the same size and thickness produced from equivalent strength material, as determined by the applicable pipe material specification; and

(D) If a fitting fails to meet the test in paragraph (c)(4)(i)(B) or (c)(4)(i)(C) of this section, no fitting in the lot from which the test fitting was chosen is acceptable.

(ii) For fittings sized above three inches—

(A) The longitudinal joints must be fabricated by arc welding;

(B) For pressures exceeding 150 pounds per square inch, each fitting must be radiographically examined as specified in Section VIII of the ASME Code;

(C) For pressures not exceeding 150 pounds per square inch, the first fitting from each size in each lot of 20 or fraction thereof must be examined by radiography to ensure that the welds are of acceptable quality;

(D) One fitting of each size from each lot of 100 or fraction thereof must be hydrostatically tested to the pressure required for a seamless drawn pipe of the same size and thickness produced from equivalent strength material, as determined by the applicable pipe material specification; and

(E) If a fitting fails to meet the test in paragraph (c)(4)(ii)(C) or (c)(4)(ii)(D) of this section, no fitting in the lot from which the test fitting was chosen is acceptable.

(d) Single welded butt joints without the use of backing strips may be employed in the fabrication of pipe joining fittings of welded construction provided radiographic examination indicates that complete penetration is obtained.

(e) Each pipe joining fitting must be marked in accordance with MSS Standard SP–25.

§56.15–5 Fluid-conditioner fittings.

(a) Fluid conditioner fittings certified in accordance with subpart 50.25 of this subchapter are acceptable for use in piping systems.

(b) Fluid conditioner fittings, not containing hazardous materials as defined in §150.115 of this chapter, which are made in accordance with the applicable standards listed in Table 56.60–1(b) of this part and of materials complying with subpart 56.60 of this part, may be used within the material, size, pressure, and temperature limitations of those standards and within any further limitations specified in this subchapter.

(c) The following requirements apply to nonstandard fluid conditioner fittings which do not contain hazardous

materials as defined in § 150.115 of this chapter:

(1) The following nonstandard fluid conditioner fittings must meet the applicable requirements in § 54.01–5 (c)(3), (c)(4), and (d) of this chapter or the remaining provisions in part 54 of this chapter, except that Coast Guard shop inspection is not required:

(i) Nonstandard fluid conditioner fittings that have a net internal volume greater than 0.04 cubic meters (1.5 cubic feet) and that are rated for temperatures and pressures exceeding those specified as minimums for Class I piping systems.

(ii) Nonstandard fluid-conditioner fittings that have an internal diameter exceeding 15 centimeters (6 inches) and that are rated for temperatures and pressures exceeding those specified as minimums for Class I piping systems.

(2) All other nonstandard fluid conditioner fittings must meet the following:

(i) All pressure-containing materials must be accepted in accordance with § 56.60–1 of this part.

(ii) Nonstandard fluid conditioner fittings must be designed so that the maximum allowable working pressure does not exceed one-fourth of the burst pressure or produce a primary stress greater than one-fourth of the ultimate tensile strength of the material for Class II systems and for all Class I, I–L, and II–L systems receiving ship motion dynamic analysis and nondestructive examination. For Class I, I–L, or II–L systems not receiving ship motion dynamic analysis and nondestructive examination under § 56.07–10(c) of this part, the maximum allowable working pressure must not exceed one-fifth of the burst pressure or produce a primary stress greater than one-fifth of the ultimate tensile strength of the material. The maximum allowable working pressure may be determined by—

(A) Calculations comparable to those of ANSI B31.1 or Section VIII of the ASME Code;

(B) Subjecting a representative model to a proof test or experimental stress analysis described in paragraph A–22 of Section I of the ASME Code; or

(C) Other means specifically accepted by the Marine Safety Center.

(iii) Nonstandard fluid conditioner fittings must be tested in accordance with § 56.97–5 of this part.

(iv) If welded, nonstandard fluid conditioner fittings must be welded in accordance with subpart 56.70 of this part and part 57 of this chapter or by other processes specifically approved by the Marine Safety Center.

(d) All fluid conditioner fittings that contain hazardous materials as defined in § 150.115 of this chapter must meet the applicable requirements of part 54 of this chapter, except subpart 54.10.

(e) Heat exchangers having headers and tubes and brazed boiler steam air heaters are not considered fluid conditioner fittings and must meet the requirements in part 54 of this chapter regardless of size. For brazed boiler steam air heaters, see also § 56.30–30(b)(1) of this part.

[CGD 77–140, 54 FR 40602, Oct. 2, 1989, as amended by CGD 83–043, 60 FR 24772, May 10, 1995]

§ 56.15–10 Special purpose fittings.

(a) Special purpose fittings certified in accordance with subpart 50.25 of this subchapter are acceptable for use in piping systems.

(b) Special purpose fittings made in accordance with the applicable standards listed in Table 56.60–1(b) of this part and of materials complying with subpart 56.60 of this part, may be used within the material, size, pressure, and temperature limitations of those standards and within any further limitations specified in this subchapter.

(c) Nonstandard special purpose fittings must meet the requirements of §§ 56.30–25, 56.30–40, 56.35–10, 56.35–15, or 56.35–35 of this part, as applicable.

Subpart 56.20—Valves

§ 56.20–1 General.

(a) Valves certified in accordance with subpart 50.25 of this subchapter are acceptable for use in piping systems.

(b) Non-welded valves complying with the standards listed in § 56.60–1 of this part may be used within the specified pressure and temperature ratings

of those standards, provided the limitations of §56.07–10(c) of this part are applied. Materials must comply with subpart 56.60 of this part. Welded valves complying with the standards and specifications listed in §56.60–1 of this part may be used in Class II systems only unless they meet paragraph (c) of this section.

(c) All other valves must meet the following:

(1) All pressure-containing materials must be accepted in accordance with §56.60–1 of this part.

(2) Valves must be designed so that the maximum allowable working pressure does not exceed one-fourth of the burst pressure or produce a primary stress greater than one-fourth of the ultimate tensile strength of the material for Class II systems and for all Class I, I–L, and II–L systems receiving ship motion dynamic analysis and nondestructive examination. For Class I, I–L, or II–L systems not receiving ship motion dynamic analysis and nondestructive examination under §56.07–10(c) of this part, the maximum allowable working pressure must not exceed one-fifth of the burst pressure or produce a primary stress greater than one-fifth of the ultimate tensile strength of the material. The maximum allowable working pressure may be determined by—

(i) Calculations comparable to those of ANSI B31.1 or Section VIII of the ASME Code, if the valve shape permits this;

(ii) Subjecting a representative model to a proof test or experimental stress analysis described in paragraph A–22 of Section I of the ASME Code; or

(iii) Other means specifically accepted by the Marine Safety Center.

(3) Valves must be tested in accordance with §56.97–5 of this part.

(4) If welded, valves must be welded in accordance with subpart 56.70 of this part and part 57 of this chapter or by other processes specifically approved by the Marine Safety Center.

(d) Where liquid trapped in any closed valve can be heated and an uncontrollable rise in pressure can result, means must be provided in the design, installation, and operation of the valve to ensure that the pressure in the valve does not exceed that allowed by this part for the attained temperature. (For example, if a flexible wedge gate valve with the stem installed horizontally is closed, liquid from testing, cleaning, or condensation can be trapped in the bonnet section of the closed valve.) Any resulting penetration of the pressure wall of the valve must meet the requirements of this part and those for threaded and welded auxiliary connections in ANSI B16.34.

[CGD 77–140, 54 FR 40604, Oct. 2, 1989; 55 FR 39968, Oct. 1, 1990]

§56.20–5 Marking (reproduces 107.2).

(a) Each valve shall bear the manufacturer's name or trademark and reference symbol to indicate the service conditions for which the manufacturer guarantees the valve. The marking shall be in accordance with MSS–SP–25.

§56.20–7 Ends.

(a) Valves may be used with flanged, threaded, butt welding, socket welding or other ends in accordance with applicable standards as specified in subpart 56.60.

§56.20–9 Valve construction.

(a) All valves must close with a right-hand (clockwise) motion of the handwheel or operating lever when facing the end of the valve stem. Gate, globe and angle valves must generally be of the rising-stem type, preferably with the stem threads external to the valve body. Where operating conditions will not permit such installations, the use of nonrising-stem valves will be permitted. Nonrising-stem valves, lever operated valves, and any other valve where, due to design, the position of the disc or closure mechanism is not obvious shall be fitted with indicators to show whether the valve is opened or closed. See §56.50–1(g)(2)(iii). Such indicators are not required for valves located in tanks or similar inaccessible spaces where indication is provided at the remote valve operator. Operating levers of the quarter-turn (rotary) valves must be parallel to the fluid flow in the open position and perpendicular to the fluid flow in the closed position.

(b) Valves of Class I piping systems (for restrictions in other classes refer

to sections on low temperature service), having diameters exceeding 2 inches must have bolted, pressure seal, or breech lock bonnets and flanged or welding ends, except that socket type welding ends shall not be used where prohibited by §56.30–5(c) of this part, §56.30–10(b)(4) of this part for the same pressure class, or elsewhere in this part. For diameters not exceeding 2 inches, screwed union bonnet or bolted bonnet, or bonnetless valves of a type which will positively prevent the stem from screwing out of the body may be employed. Outside screw and yoke design must be used for valves 3 inches and larger for pressures above 600 pounds per square inch gage. Cast iron valves with screwed-in or screwed-over bonnets are prohibited. Union bonnet type cast iron valves must have the bonnet ring made of steel, bronze, or malleable iron.

(c) Valves must be designed for the maximum pressure to which they may be subjected, but in no case shall the design pressure be less than 50 pounds per square inch gage. The use of wafer type resilient seated valves is not permitted for shell connections unless they are so arranged that the piping immediately inboard of the valve can be removed without affecting the watertight integrity of the shell connection. Refer also to §56.20–15(b)(2)(iii) of this part. Large fabricated ballast manifold connecting lines exceeding 8 inches nominal pipe size must be designed for a pressure of not less than 25 pounds per square inch gage.

(d) Disks or disk faces, seats, stems and other wearing parts of valves shall be made of material possessing corrosion and heat-resisting qualities suitable for the service conditions to which they may be subjected.

(e) Plug cocks shall be constructed with satisfactory and positive means of preventing the plug from becoming loosened or removed from the body when the plug is operated. Cocks having plug locking arrangements depending on cotter pins are prohibited.

(f) Cocks shall be marked in a straight line with the body to indicate whether they are open or closed.

(g) Materials forming a portion of the pressure barrier shall comply with the applicable provisions of this part.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 77–140, 54 FR 40604, Oct. 2, 1989; CGD 95–012, 60 FR 48050, Sept. 18, 1995; USCG–2004–18884, 69 FR 58346, Sept. 30, 2004]

§ 56.20–15 Valves employing resilient material.

(a) A valve in which the closure is accomplished by resilient nonmetallic material instead of a metal to metal seat shall comply with the design, material, construction and testing for valves specified in this part.

(b) Valves employing resilient material shall be divided into three categories, Positive shutoff, Category A, and Category B, and shall be tested and used as follows:

(1) *Positive shutoff valves.* The closed valve must pass less than 10 ml/hr (0.34 fluid oz/hr) of liquid or less than 3 l/hr (0.11 cubic ft/hr) of gas per inch nominal pipe size through the line after removal of all resilient material and testing at full rated pressure. Packing material must be fire resistant. Piping subject to internal head pressure from a tank containing oil must be fitted with positive shutoff valves located at the tank in accordance with §56.50–60(d). Otherwise positive shutoff valves may be used in any location in lieu of a required Category A or Category B valve.

(2) *Category A valves.* The closed valve must pass less than the greater of 5 percent of its fully open flow rate or 15 percent divided by the square root of the nominal pipe size (NPS) of its fully open flow rate through the line after complete removal of all resilient seating material and testing at full rated pressure; as represented by the formula: (15% / SQRT × (NPS)) (Fully open flow rate). Category A valves may be used in any location except where positive shutoff valves are required by §56.50–60(d). Category A valves are required in the following locations:

(i) Valves at vital piping system manifolds;

(ii) Isolation valves in cross-connects between two piping systems, at least one of which is a vital system, where

failure of the valve in a fire would prevent the vital system(s) from functioning as designed.

(iii) Valves providing closure for any opening in the shell of the vessel.

(3) *Category B valves.* The closed valve will not provide effective closure of the line or will permit appreciable leakage from the valve after the resilient material is damaged or destroyed. Category B valves are not required to be tested and may be used in any location except where a Category A or positive shutoff valve is required.

(c) If a valve designer elects to use either calculations or actual fire testing in lieu of material removal and pressure testing, the proposed calculation method or test plan must be accepted by the Commandant (G–MSE).

[CGD 95–028, 62 FR 51200, Sept. 30, 1997]

§56.20–20 Valve bypasses.

(a) Sizes of bypasses shall be in accordance with MSS–SP–45.

(b) Pipe for bypasses should be at least Schedule 80 seamless, and of a material of the same nominal chemical composition and physical properties as that used for the main line. Lesser thickness may be approved depending on the installation and service conditions.

(c) Bypasses may be integral or attached.

Subpart 56.25—Pipe Flanges, Blanks, Flange Facings, Gaskets, and Bolting

§56.25–5 Flanges.

Flanges must conform to the design requirements of the applicable standards of Table 56.60–1(b) of this part or Appendix 2 of section VIII of the ASME Code. Plate flanges must meet the requirements of §56.30–10(b)(5) of this part and the material requirements of §56.60–1(a) of this part. Flanges may be integral or may be attached to pipe by threading, welding, brazing, or other means within the applicable standards specified in Table 56.60–1(b) of this part and the requirements of this subpart. For flange facing gasket combinations other than those specified above, calculations must be submitted indicating that the gaskets will not result in a higher bolt loading or flange moment than for the acceptable configurations.

[CGD 77–140, 54 FR 40605, Oct. 2, 1989, as amended by USCG–2002–13058, 67 FR 61278, Sept. 30, 2002]

§56.25–7 Blanks.

(a) Blanks shall conform to the design requirements of 104.5.3 of ANSI–B31.1.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970]

§56.25–10 Flange facings.

(a) Flange facings shall be in accordance with the applicable standards listed in Table 56.60–1(b) and MSS–SP–6.

(b) When bolting class 150 standard steel flanges to flat face cast iron flanges, the steel flange must be furnished with a flat face, and bolting must be in accordance with §56.25–20 of this part. Class 300 raised face steel flanges may be bolted to class 250 raised face cast iron flanges with bolting in accordance with §56.25–20(b) of this part.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 77–140, 54 FR 40605, Oct. 2, 1989]

§56.25–15 Gaskets (reproduces 108.4).

(a) Gaskets shall be made of materials which are not injuriously affected by the fluid or by temperature.

(b) Only metallic and suitable asbestos-free nonmetallic gaskets may be used on flat or raised face flanges if the expected normal operating pressure exceeds 720 pounds per square inch or the operating temperature exceeds 750 °F.

(c) The use of metal and nonmetallic gaskets is not limited as to pressure provided the gasket materials are suitable for the maximum fluid temperatures.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 86–035, 54 FR 36316, Sept. 1, 1989]

§56.25–20 Bolting.

(a) *General.* (1) Bolts, studs, nuts, and washers must comply with applicable standards and specifications listed in §56.60–1 of this part. Unless otherwise specified, bolting must be in accordance with ANSI B16.5.

(2) Bolts and studs must extend completely through the nuts.

(3) See § 58.30–15(c) of this chapter for exceptions on bolting used in fluid power and control systems.

(b) Carbon steel bolts or bolt studs may be used if expected normal operating pressure does not exceed 300 pounds per square inch gage and the expected normal operating temperature does not exceed 400 °F. Carbon steel bolts must have heavy hexagon heads in accordance with ANSI B18.2.1 and must have heavy semifinished hexagonal nuts in accordance with ANSI B18.2.2, unless the bolts are tightly fitted to the holes and flange stress calculations taking the bolt bending stresses into account are submitted. When class 250 cast iron flanges are used or when class 125 cast iron flanges are used with ring gaskets, the bolting material must be carbon steel conforming to ASTM Specification A 307 (incorporated by reference, see § 56.01–2), Grade B.

(c) Alloy steel stud bolts must be threaded full length or, if desired, may have reduced shanks of a diameter not less than that at the root of the threads. They must have heavy semifinished hexagonal nuts in accordance with ANSI B18.2.2.

(d) All alloy bolts or bolt studs and accompanying nuts are recommended to be threaded in accordance with ANSI B1.1, Class 2A external threads, and Class 2B internal threads (8-thread series 8UN for 1 inch and larger).

(e) (Reproduces 108.5.6.) Washers, when used under nuts, shall be of forged or rolled steel.

[CGFR 68–82, 33 FR 18843, Dec.18, 1968, as amended by CGD 77–140, 54 FR 40605, Oct. 2, 1989; USCG–2000–7790, 65 FR 58460, Sept. 29, 2000]

Subpart 56.30—Selection and Limitations of Piping Joints

§ 56.30–1 Scope (replaces 110 through 118).

(a) The selection and limitation of piping joints shall be as required by this subpart in lieu of requirements in 110 through 118 of ANSI–B31.1; however certain requirements are marked "reproduced" in this subpart.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970]

§ 56.30–3 Piping joints (reproduces 110).

The type of piping joint used shall be suitable for the design conditions and shall be selected with consideration of joint tightness, mechanical strength and the nature of the fluid handled.

§ 56.30–5 Welded joints.

(a) *General.* Welded joints may be used for materials for which welding procedures, welders, and welding machine operators have been qualified in accordance with part 57 of this subchapter.

(b) *Butt welds—general.* Butt welds may be made with or without backing or insert rings within the limitations established in § 56.70–15. When the use of backing rings will result in undesirable conditions such as severe stress concentrations, corrosion or erosion, then:

(1) The backing rings shall be removed and the inside of the joint ground smooth, or

(2) The joint shall be welded without backing rings, or

(3) Consumable insert rings must be used. Commonly used types of butt welding end preparations are shown in ANSI B16.25.

(4) Restrictions as to the use of backing rings appear for the low temperature piping systems and should be checked when designing for these systems.

(c) *Socket welds (modifies 127.3.3A).* (1) Socket welds must conform to ANSI B16.11, applicable standards listed in Table 56.60–1(b) of this part, and Figure 127.4.4C in ANSI B31.1 as modified by § 56.30–10(b)(4) of this part. A gap of approximately one-sixteenth inch between the end of the pipe and the bottom of the socket must be provided before welding. This may best be provided by bottoming the pipe and backing off slightly before tacking.

(2) Socket welds must not be used where severe erosion or crevice corrosion is expected to occur. Restrictions on the use of socket welds appear in

§56.70–15(d)(3) of this part for Class I service and in §56.50–105 of this part for low temperature service. These sections should be checked when designing for these systems. See §56.70–15(d)(4) of this part for Class II service.

(3) (Reproduces 111.3.4.) Drains and bypasses may be attached to a valve of fitting by socket welding provided the socket depth, bore diameter, and shoulder thickness conform to ANSI B16.11.

(d) *Fillet welds.* Fillet welds may vary from convex to concave. The size of a fillet weld is determined as shown in Figure 127.4.4A of ANSI B31.1. Fillet weld details for socket-welding components must meet §56.30–5(c) of this part. Fillet weld details for flanges must meet §56.30–10 of this part. See also §56.70–15(d)(3) and (d)(4) of this part for applications of fillet welds.

(e) *Seal welds.* Seal welds may be used but shall not be considered as contributing any strength to the joint.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 77–140, 54 FR 40605, Oct. 2, 1989; CGD 95–012, 60 FR 48050, Sept. 18, 1995]

§56.30–10 Flanged joints (modifies 104.5.1(a)).

(a) Flanged or butt-welded joints are required for Classes I and I–L piping for nominal diameters exceeding 2 inches, except as otherwise specified in this subchapter.

(b) Flanges may be attached by any method shown in Figure 56.30–10(b) or by any additional means that may be approved by the Marine Safety Center. Pressure temperature ratings of the appropriate ANSI standard must not be exceeded.

(1) *Figure 56.30–10(b), Method 1.* Flanges with screw threads may be used in accordance with Table 56.30–20(c) of this part.

(2) *Figure 56.30–10(b), Method 2.* ANSI B16.5 class 150 and class 300 low-hubbed flanges with screw threads, plus the addition of a strength fillet weld of the size as shown, may be used in Class I systems not exceeding 750 °F or 4 NPS, in Class II systems without diameter limitations, and in Class II–L systems not exceeding 1 NPS. If 100 percent radiography is required by §56.95–10 of this part for the class, diameter, wall thickness, and material of pipe being joined, the use of the threaded flanges is not permitted and buttwelding flanges must be provided. For Class II piping systems, the size of the strength fillet may be limited to a maximum of 0.525 inch instead of 1.4T.

(3) *Figure 56.30–10(b), Method 3.* ANSI B16.5 slip-on flanges may be used in Class I, Class II, or Class II–L systems not to exceed the service pressure-temperature ratings for the class 300 and lower class flanges, within the temperature limitations of the material selected for use, and not to exceed 4 NPS in Class I and Class II–L systems. If 100 percent radiography is required by §56.95–10 of this part for the class, diameter, wall thickness, and material of the pipe being joined, the use of slip-on flanges is not permitted and a butt welding flange must be provided. The configuration in Figure 127.4.4B(b) of ANSI B31.1. utilizing a face and backweld may be preferable in those applications where it is desirable to eliminate void spaces. For Class II piping systems, the size of the strength fillet may be limited to a maximum of 0.525 inch instead of 1.4T and the distance from the face of the flange to the end of the pipe may be a maximum of three-eighths inch. Restrictions on the use of slip-on flanges appear in §56.50–105 of this part for low temperature piping systems.

(4) *Figure 56.30–10(b), Method 4.* ANSI B16.5 socket welding flanges may be used in Class I or II–L systems not exceeding 3 NPS for class 600 and lower class flanges and 2½ NPS for class 900 and class 1500 flanges within the service pressure-temperature ratings of the standard. Whenever full radiography is required by §56.95–10 for the class, diameter, and wall thickness of the pipe being joined, the use of socket welding flanges in not permitted and a butt weld type connection must be provided. For Class II piping, socket welding flanges may be used without diameter limitation, and the size of the fillet weld may be limited to a maximum of 0.525 inch instead of 1.4T. Restrictions on the use of socket welds appear in §56.50–105 for low temperature piping systems.

(5) *Figure 56.30–10(b), Method 5.* Flanges fabricated from steel plate meeting the requirements of part 54 of

this chapter may be used for Class II piping for pressures not exceeding 150 pounds per square inch and temperatures not exceeding 450 °F. Plate material listed in UCS–6(b) Section VIII of the ASME Code may not be used in this application, except that material meeting ASTM Specification A 36 (incorporated by reference, see §56.01–2) may be used. The fabricated flanges must conform at least to the American National Standard class 150 flange dimensions. The size of the strength fillet weld may be limited to a maximum of 0.525 inches instead of 1.4T and the distance from the face of the flange to the end of the pipe may be a maximum of three-eighths inch.

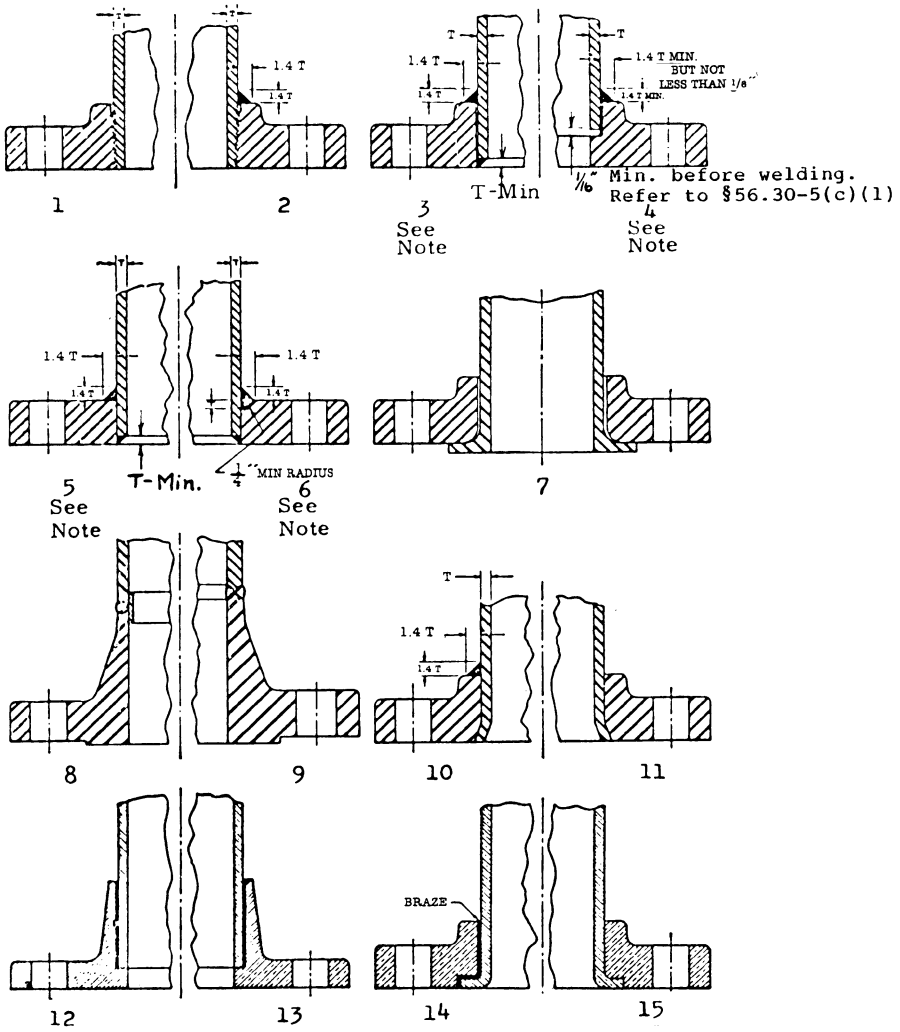

FIGURE 56.30–10(B)—METHODS OF ATTACHMENT

NOTE: T is nominal pipe wall thickness used. Refer to text in §56.30–10(b) for modifications on Class II piping systems. Fillet weld leg size need not exceed the thickness of the applicable ANSI hub.

(6) *Figure 56.30–10(b), Method 6.* Steel plate flanges meeting the material and construction requirements listed in subparagraph (5) of this paragraph may be used for Class II piping for pressures not exceeding 150 pounds per square inch or temperatures not exceeding 650 °F. The flange shall be attached to the pipe as shown by Figure 56.30–10(b). Method 6. The pressure shall not exceed the American National Standard Service pressure temperature rating. The size of the strength fillet weld may be limited to a maximum of 0.525 inch instead of 1.4T and the distance from the face of the flange to the end of the pipe may be a maximum of three-eighths inch.

(7) *Figure 56.30–10(b), Method 7.* Lap joint flanges (Van Stone) may be used for Class I and Class II piping. The Van Stone equipment shall be operated by competent personnel. The ends of the pipe shall be heated from 1,650° to 1,900 °F. dependent on the size of the pipe prior to the flanging operation. The foregoing temperatures shall be carefully adhered to in order to prevent excess scaling of the pipe. The extra thickness of metal built up in the end of the pipe during the forming operation shall be machined to restore the pipe to its original diameter. The machined surface shall be free from surface defects and the back of the Van Stone lap shall be machined to a fine tool finish to furnish a line contact with the mating surface on the flange for the full circumference as close as possible to the fillet of the flange. The number of heats to be used in forming a flange shall be determined by the size of the pipe and not more than two pushups per heat are permitted. The width of the lap flange shall be at least three times the thickness of the pipe wall and the end of the pipe shall be properly stress relieved after the flanging operation is completed. Manufacturers desiring to produce this type of joint shall demonstrate to a marine inspector that they have the proper equipment and personnel to produce an acceptable joint.

(8) *Figure 56.30–10(b), Method 8.* Welding neck flanges may be used on any piping provided the flanges are butt-welded to the pipe. The joint shall be welded as indicated by Figure 56.30–10(b), Method 8, and a backing ring employed which will permit complete penetration of the weld metal. If a backing ring is not used, refer to §56.30–5(b) for requirements.

(9) *Figure 56.30–10(b), Method 9.* Welding neck flanges may also be attached to pipe by a double-welded butt joint as shown by Figure 56.30–10(b), Method 9.

(10) *Figure 56.30–10(b), Method 10.* Flanges may be attached by shrinking the flange on to the end of the pipe and flaring the end of the pipe to an angle of not less than 20°. A fillet weld of the size shown by Figure 56.30–10(b), Method 10, shall be used to attach the hub to the pipe. This type of flange is limited to a maximum pressure of 300 pounds per square inch at temperatures not exceeding 500 °F.

(11) *Figure 56.30–10(b), Method 11.* The flange of the type described and illustrated by Figure 56.30–10(b), Method 10, except with the fillet weld omitted, may be used for Class II piping for pressures not exceeding 150 pounds per square inch and temperatures not exceeding 450 °F.

(12) *Figure 56.30–10(b), Method 12.* High-hub bronze flanges may be used for temperatures not exceeding 425 °F. The hub of the flange shall be bored to a depth not less than that required for a threaded connection of the same diameter leaving a shoulder for the pipe to butt against. A preinserted ring of silver brazing alloy having a melting point not less than 1,000 °F. and of sufficient quantity to fill the annular clearance between the flange and the pipe shall be inserted in the groove. The pipe shall then be inserted in the flange and sufficient heat applied externally to melt the brazing alloy until it completely fills the clearance between the hub and the flange of the pipe. A suitable flux shall be applied to the surfaces to be joined to produce a satisfactory joint.

(13) *Figure 56.30–10(b), Method 13.* The type of flange as described for Figure 56.30–10(b), Method 12, may be employed and in lieu of an annular groove being machined in the hub of the flange

for the preinserted ring of silver brazing alloy, a bevel may be machined on the end of the hub and the silver brazing alloy introduced from the end of the hub to attach the pipe to the flange.

(14) *Figure 56.30–10(b), Method 14.* Flanges may be attached to nonferrous pipe by inserting the pipe in the flange and flanging the end of the pipe into the recess machined in the face of the flange to receive it. The width of the flange shall be not less than three times the pipe wall thickness. In addition, the pipe shall be securely brazed to the wall of the flange.

(15) *Figure 56.30–10(b), Method 15.* The flange of the type described and illustrated by Figure 56.30–10(b), Method 14, except with the brazing omitted, may be used for Class II piping and where the temperature does not exceed 250 °F.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 77–140, 54 FR 40605, Oct. 2, 1989; USCG–2000–7790, 65 FR 58460, Sept. 29, 2000]

§ 56.30–15 Expanded or rolled joints.

(a) Expanded or rolled joints may be used where experience or test has demonstrated that the joint is suitable for the design conditions and where adequate provisions are made to prevent separation of the joint. Specific application for use must be made to the Commandant.

(b) [Reserved]

§ 56.30–20 Threaded joints.

(a) Threaded joints may be used within the limitations specified in subpart 56.15 of this chapter and within other limitations specified in this section.

(b) (Reproduces 114.1.) All threads on piping components must be taper pipe threads in accordance with the applicable standard listed in Table 56.60–1(b). Threads other than taper pipe threads may be used for piping components where tightness of the joint depends on a seal weld or a seating surface other than the threads, and where experience or test has demonstrated that such threads are suitable.

(c) Threaded joints may not be used where severe erosion, crevice corrosion, shock, or vibration is expected to occur; or at temperatures over 925 °F. Size limitations are given in Table 56.30–20(c) of this section.

TABLE 56.30–20(C)—THREADED JOINTS [1] [2]

Maximum nominal size, inches	Maximum pressure, p.s.i.g.
Above 2″	(Not permitted in Class I piping service.)
Above 1″ up to 2″	600.
Above ¾″ up to 1″	1,200.
¾″ and below	1,500.

[1] Further restrictions on the use of threaded joints appear in the low temperature piping section.
[2] Threaded joints in hydraulic systems are permitted above the pressures indicated for the nominal sizes shown when commercially available components such as pumps, valves and strainers may only be obtained with threaded connections.

(d) Pipe with a wall thickness less than that of standard weight of ANSI B36.10 steel pipe must not be threaded regardless of service. For additional threading limitations for pipe used in steam service over 250 pounds per square inch or water service over 100 pounds per square inch and 200 °F, see part 104.1.2(c)(1) of ANSI B31.1. Restrictions as to the use of threaded joints appear for low temperature piping and should be checked when designing for these systems.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 73–254, 40 FR 40164, Sept. 2, 1975; CGD 77–140, 54 FR 40606, Oct. 2, 1989]

§ 56.30–25 Flared, flareless, and compression fittings.

(a) This section applies to pipe fittings that are mechanically connected to pipe by such means as ferrules, flared ends, swaging, elastic strain preload, crimping, bite-type devices, and shape memory alloys. Fittings to which this section applies must be designed, constructed, tested, and marked in accordance with ASTM F 1387 (incorporated by reference, see § 56.01–2). Previously approved fittings may be retained as long as they are maintained in good condition to the satisfaction of the Officer in Charge, Marine Inspection.

(b) Flared, flareless and compression fittings may be used within the service limitations of size, pressure, temperature, and vibration recommended by the manufacturer and as specified in this section.

(c) Flared, flareless, and compression type tubing fittings may be used for

tube sizes not exceeding 50 millimeters (2 inches) outside diameter within the limitations of applicable standards and specifications listed in this section and §56.60–1 of this part.

(d) Flareless fittings must be of a design in which the gripping member or sleeve must grip or bite into the outer surface of the tube with sufficient strength to hold the tube against pressure, but without appreciably distorting the inside tube diameter or reducing the wall thickness. The gripping member must also form a pressure seal against the fitting body.

(e) For fluid services, other than hydraulic systems, using a combustible fluid as defined in §30.10–15 of this chapter and for fluid services using a flammable fluid as defined in §30.10–22 of this chapter, flared fittings must be used; except that flareless fittings of the nonbite type may be used when the tubing system is of steel, nickel copper or copper nickel alloy. When using copper or copper zinc alloy, flared fittings are required. (See also §56.50–70 for gasoline fuel systems, §56.50–75 for diesel fuel systems, and §58.25–20 for hydraulic systems for steering gear.)

[CGD 95–027, 61 FR 26000, May 23, 1996; 61 FR 35138, July 5, 1996, as amended by USCG–1999–5151, 64 FR 67180, Dec. 1, 1999; USCG–2000–7790, 65 FR 58460, Sept. 29, 2000]

§56.30–27 Caulked joints.

Caulked joints may not be used in marine installations.

[CGD 77–140, 54 FR 40606, Oct. 2, 1989]

§56.30–30 Brazed joints.

(a) *General* (*refer also to subpart 56.75*). Brazed socket-type joints shall be made with suitable brazing alloys. The minimum socket depth shall be sufficient for the intended service. Brazing alloy shall either be end-fed into the socket or shall be provided in the form of a preinserted ring in a groove in the socket. The brazing alloy shall be sufficient to fill completely the annular clearance between the socket and the pipe or tube.

(b) *Limitations.* (1) Brazed socket-type joints shall not be used on systems containing flammable or combustible fluids in areas where fire hazards are involved or where the service temperature exceeds 425 °F. When specifically approved by the Commandant, brazed construction may be used for service temperatures up to 525 °F. in boiler steam air heaters provided the requirements of UB–12 of section VIII of the ASME Code are satisfied at the highest temperature desired.

(2) Brazed joints depending solely upon a fillet, rather than primarily upon brazing material between the pipe and socket are not acceptable.

§56.30–35 Gasketed mechanical couplings.

(a) This section applied to pipe fittings that form a seal by compressing a resilient gasket onto the pipe joint primarily by threaded fasteners and where joint creep is only restricted by such means as machined grooves, centering pins, or welded clips. Fittings to which this section applies must be designed, constructed, tested, and marked in accordance with ASTM F 1476 (incorporated by reference, see §56.01–2) and ASTM F 1548 (incorporated by reference, see §56.01–2). Previously approved fittings may be retained as long as they are maintained in good condition to the satisfaction of the Officer in Charge, Marine Inspection.

(b) Gasketed mechanical couplings may be used within the service limitations of pressure, temperature and vibration recommended by the manufacturer, except that gasketed mechanical couplings must not be used in—

(1) Any location where leakage, undetected flooding or impingement of liquid on vital equipment may disable the vessel; or

(2) In tanks where the liquid conveyed in the piping system is not chemically compatible with the liquid in the tank.

(c) Gasketed mechanical couplings must not be used as expansion joints. Positive restraints must be included, where necessary, to prevent the coupling from creeping on the pipe and uncovering the joint. Bite-type devices do not provide positive protection against creep and are generally not accepted for this purpose. Machined grooves, centering pins, and welded clips are

considered positive means of protection against creep.

[CGD 95–027, 61 FR 26001, May 23, 1996, as amended by USCG–1999–5151, 64 FR 67180, Dec. 1, 1999]

§ 56.30–40 Flexible pipe couplings of the compression or slip-on type.

(a) Flexible pipe couplings of the compression or slip-on type must not be used as expansion joints. To ensure that the maximum axial displacement (approximately ⅜″ maximum) of each coupling is not exceeded, positive restraints must be included in each installation.

(b) Positive means must also be provided to prevent the coupling from "creeping" on the pipe and uncovering the joint. Bite type devices do not provide positive protection against creeping and are not generally accepted for this purpose unless other means are also incorporated. Machined grooves or centering pins are considered positive means, and other positive means will be considered.

(c) Couplings which employ a solid sleeve with welded attachments on both pipes will require the removal of one set of attachments before dismantling. Rewelding of the attachments may require gas freeing of the line.

(d) The installation shall be such as to preclude appreciable difference in the vibration magnitudes of the pipes joined by the couplings. The couplings shall not be used as a vibration damper. The vibration magnitude and frequency should not exceed that recommended by the coupling manufacturer.

(e) Flexible couplings made in accordance with the applicable standards listed in Table 56.60–1(b) of this part and of materials complying with subpart 56.60 of this part may be used within the material, size, pressure, and temperature limitations of those standards and within any further limitations specified in this subchapter. Flexible couplings fabricated by welding must also comply with part 57 of this chapter.

(f) Flexible couplings must not be used in cargo holds or in any other space where leakage, undetected flooding, or impingement of liquid on vital equipment may disable the ship, or in tanks where the liquid conveyed in the piping system is not compatible with the liquid in the tank. Where flexible couplings are not allowed by this subpart, joints may be threaded, flanged and bolted, or welded.

(g) Damaged or deteriorated gaskets shall not be reinstalled.

(h) Each coupling shall be tested in accordance with § 56.97–5.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 77–140, 54 FR 40606, Oct. 2, 1989]

Subpart 56.35—Expansion, Flexibility and Supports

§ 56.35–1 Pipe stress calculations (replaces 119.7).

(a) A summary of the results of pipe stress calculations for the main and auxiliary steam piping where the design temperatures exceed 800 °F shall be submitted for approval. Calculations shall be made in accordance with one of the recognized methods of stress analysis acceptable to the Marine Safety Center to determine the magnitude and direction of the forces and movements at all terminal connections, anchor and junction points, as well as the resultant bending stress, longitudinal pressure stress, torsional stress, and combined expansion stress at all such points. The location of the maximum combined stress shall be indicated in each run of pipe between anchor points.

(b) Special consideration will be given to the use of the full tabulated value of S in computing S_h and S_c where all material used in the system is subjected to additional nondestructive testing as specified by the Marine Safety Center, and where the calculations prescribed in 119.6.4 and 102.3.2 of ANSI–B31.1 and § 56.07–10 are performed. The nondestructive testing procedures and method of stress analysis shall be approved by the Marine Safety Center prior to the submission of computations and drawings for approval.

[CGD 77–140, 54 FR 40607, Oct. 2, 1989]

§ 56.35–10 Nonmetallic expansion joints (replaces 119.5.1).

(a) Nonmetallic expansion joints certified in accordance with subpart 50.25

of this subchapter are acceptable for use in piping systems.

(b) Nonmetallic expansion joints must conform to the standards listed in Table 56.60–1(b) of this part. Nonmetallic expansion joints may be used within their specified pressure and temperature rating in vital and nonvital machinery sea connections inboard of the skin valve. These joints must not be used to correct for improper piping workmanship or misalignment. Joint movements must not exceed the limits set by the joint manufacturer.

[CGD 77–140, 54 FR 40607, Oct. 2, 1989]

§ 56.35–15 Metallic expansion joints (replaces 119.5.1).

(a) Metallic expansion joints certified in accordance with subpart 50.25 of this subchapter are acceptable for use in piping systems.

(b) Metallic expansion joints must conform to the standards listed in Table 56.60–1(b) of this part and may be used within their specified pressure and temperature rating.

[CGD 77–140, 54 FR 40607, Oct. 2, 1989]

Subpart 56.50—Design Requirements Pertaining to Specific Systems

§ 56.50–1 General (replaces 122.6 through 122.10).

The piping requirements in this subpart shall apply in lieu of requirements in 122.6 through 122.10 of ANSI–B31.1. Installation requirements applicable to all systems:

(a) Where pipes and scuppers are carried through watertight or oiltight bulkheads, decks or tank tops, or are carried through fire control bulkheads and decks, the integrity of the structure shall be maintained. Lead or other heat sensitive materials shall not be used in piping systems which make such bulkhead or deck penetrations where the deterioration of such systems in the event of fire would impair the integrity of the bulkheads or decks. (For plastic pipe installations, see § 56.60–25(a).) Where plate insert pads are used, bolted connections shall have threads tapped into the plate to a depth of not less than the diameter of the bolt. If welded, the pipe or flange shall be welded to both sides of the plating. Openings in structure through which pipes pass shall be reinforced where necessary. Flanges shall not be bolted to bulkheads so that the plate forms a part of the joint. Metallic materials having a melting point of 1,700 °F. or less are considered heat sensitive and if used must be suitably insulated.

(b)(1) Pipes piercing the collision bulkhead shall be fitted with screwdown valves operable from above the bulkhead deck and the valve shall be fitted inside the forepeak tank adjacent to the collision bulkhead. The pipe penetrating the collision bulkhead shall be welded to the bulkhead on both sides. On new installations or replacement in vessels of 150 gross tons and over, the valve body shall be of steel or ductile cast iron.

(2) Passenger vessels shall not have the collision bulkhead pierced below the margin line by more than one pipe conveying liquids in the forepeak tank except that if the forepeak tank is divided to hold two different kinds of liquids, the collision bulkhead may be pierced below the margin line by two pipes, provided there is no practical alternative to the fitting of the second pipe and further provided the safety of the vessel is maintained.

(c) Valves and cocks not forming part of a piping system are not permitted in watertight subdivision bulkheads, however, sluice valves or gates in oiltight bulkheads of tankships may be used if approved by the Marine Safety Center.

(d) Piping shall not be run over or in the vicinity of switchboards or other electrical equipment if avoidable. When such leads are necessary, welded joints only shall be used and provision shall be made to prevent leakage from damaging the equipment.

(e) Stuffing boxes shall not be used on deep tank bulkheads, double bottoms or in any position where they cannot be easily examined. This requirement does not apply to ore carriers operating on the Great Lakes or cargo lines of oil tankers.

(f) Piping systems shall be installed so that under no condition will the operation of safety or relief valves be impaired.

(g)(1) Power actuated valves in systems other than as specified in § 56.50–60 of this part may be used if approved for the system by the Marine Safety Center. All power actuated valves required in an emergency to operate the vessel's machinery, to maintain its stability, and to operate the bilge and firemain systems must have a manual means of operation.

(2)(i) Remote valve controls that are not readily identifiable as to service must be fitted with nameplates.

(ii) Remote valve controls must be accessible under service conditions.

(iii) Remote valve controls, except reach rods, must be fitted with indicators that show whether the valves they control are open or closed. Valve position indicating systems must be independent of valve control systems.

(iv) Valve reach rods must be adequately protected.

(v) Solid reach rods must be used in tanks containing liquids, except that tank barges having plug cocks inside cargo tanks may have reach rods of extra-heavy pipe with the annular space between the lubricant tube and the pipe wall sealed with a nonsoluble to prevent penetration of the cargo.

(3) Air operated remote control valves must be provided with self-indicating lines at the control boards which indicate the desired valve positions, i.e., open or closed.

(h) Suitable drains shall be provided at low points of piping systems.

(i) Valves and cocks shall be located so as to be easily accessible and valves or cocks attached to the shell of the vessel or to sea chests located below the floorplating shall be operable from above the floorplates.

(j) When welded fabrication is employed, a sufficient number of detachable joints shall be provided to facilitate overhauling and maintenance of machinery and appurtenances. The joints shall be located so that adequate space is provided for welding, and the location of the welds shall be indicated on the plans.

(k) Piping, including valves, pipe fittings and flanges, conveying vapors, gases or liquids whose temperature exceeds 150 °F., shall be suitably insulated where necessary to preclude injury to personnel.

(l) Where pipes are run through dry cargo spaces they must be protected from mechanical injury by a suitable enclosure or other means.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 77–140, 54 FR 40607, Oct. 2, 1989]

§ 56.50–10 Special gaging requirements.

(a) Where pressure reducing valves are employed (see 102.2.5(b) of ANSI–B31.1) a pressure gage shall be provided on the low pressure side of the reducing station.

(b) Fuel oil service, fire, cargo and fuel oil transfer and boiler feed pumps must be provided with a pressure gage on the discharge side of the pump. Additional information pertaining to fire pumps is in § 34.10–5 of subchapter D (Tank Vessels), § 76.10–5 of subchapter H (Passenger Vessels), § 95.10–5 of subchapter I (Cargo and Miscellaneous Vessels), and § 108.417 of subchapter IA (Mobile Offshore Drilling Units) of this chapter.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 73–251, 43 FR 56799, Dec. 4, 1978]

§ 56.50–15 Steam and exhaust piping.

(a) The design pressures of the steam piping connected to the boiler drum or to the superheater inlet header shall not be less than the lowest pressure setting of any drum safety valve. The value of allowable stress for the material shall not exceed that corresponding to the saturated steam temperature at drum pressure and shall be selected as described in § 56.07–10(e).

(b) Main superheater outlet piping systems, desuperheated piping systems, and other auxiliary superheated piping systems led directly from the boiler superheater shall be designed for a pressure not less than the pressure at which the superheater safety valve is set. In the case of a superheated safety valve which is drum pilot actuated, the design pressure of such piping systems shall not be less than the pressure setting of the actuator valve on the drum. Where it can be shown that the limitations set forth in 102.2.4 of ANSI–B31.1 will not be exceeded, the design pressure of such piping systems may be reduced but shall not be less than the

pressure setting of the actuator valve on the drum less the pressure drop through the superheater, including associated piping and a control desuperheater if fitted, at the normal rated operating condition. In both cases, the value of allowable stress shall be selected using a temperature not less than that of the steam at the superheater outlet at the normal rated operating conditions in accordance with §56.07–10(e). Valves and fittings shall be selected for the above temperature and pressure from the accepted standards in Table 56.60–1(b), using the pressure-temperature rating in the standard.

(c) Steam stop valves in sizes exceeding 6 inches shall be fitted with bypasses for heating the line and equalizing the pressure before the valve is opened.

(d) In multiple boiler installations each boiler's main, auxiliary and desuperheated steam lines shall be fitted with two valves, one a stop valve and one a stop check valve.

(e) Main and auxiliary steam stop valves must be readily accessible, operable by one person and arranged to seat against boiler pressure.

(f) Where vessels are equipped with more than one boiler, the auxiliary steam piping shall be so arranged that steam for the whistle, steering gear, and electric-lighting plant may be supplied from any power boiler.

(g) Steam and exhaust pipes shall not be led through coal bunkers or dry cargo spaces unless approved by the Commandant.

(h)(1) Steam piping, with the exception of the steam heating system, must not be led through passageways, accommodation spaces, or public spaces unless the arrangement is specifically approved by the Marine Safety Center.

(2) Steam pressure in steam heating systems must not exceed 150 pounds per square inch gage, except that steam pressure for accommodation and public space heating must not exceed 45 pounds per square inch gage.

(3) Steam lines and registers in non-accommodation and non-public spaces must be suitably located and/or shielded to minimize hazards to any personnel within the space. Where hazards in a space cannot be sufficiently minimized, the pressure in the steam line to that space must be reduced to a maximum of 45 pounds per square inch gage.

(4) High temperature hot water for heating systems may not exceed 375°F.

(i) Where positive shutoff valves are fitted in the exhaust lines of machinery, and the exhaust side, including engine steam cylinders and chests, turbine casings, exhaust piping and shutoff valves, is not designed for the full inlet pressure, the exhaust side must be protected from over pressure by one of the following means:

(1) A full flow relief valve in the exhaust side so set and of sufficient capacity to prevent the exhaust side from being accidentally or otherwise subjected to a pressure in excess of its maximum allowable pressure.

(2) A sentinel relief valve or other warning device fitted on the exhaust side together with a back pressure trip device which will close the inlet valve prior to the exhaust side pressure exceeding the maximum allowable pressure. A device that will throttle the inlet valve, so that the exhaust side does not exceed the maximum allowable pressure, may be substituted for the back pressure trip.

(j) Shore steam connections shall be fitted with a relief valve set at a pressure not exceeding the design pressure of the piping.

(k) Means must be provided for draining every steam pipe in which dangerous water hammer might otherwise occur.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGFR 72–59R, 37 FR 6189, Mar. 25, 1972; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CGD 77–140, 54 FR 40607, Oct. 2, 1989; CGD 83–043, 60 FR 24772, May 10, 1995]

§56.50–20 Pressure relief piping.

(a) *General.* There must be no intervening stop valves between the vessel or piping system being protected and its protective device or devices, except as specifically provided for in other regulations or as specifically authorized by the Marine Safety Center.

(b) *Discharge lines (reproduces 122.6.2(d)).* Discharge lines from pressure-relieving safety devices shall be designed to facilitate drainage.

(c) *Stop valves.* Stop valves between the safety or relief valve and the point of discharge are not permitted, except as specifically provided for in other regulations or as specifically approved by the Marine Safety Center.

(d) *Reference.* See also § 56.07–10(a) and (b) for specific requirements.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970; CGD 77–140, 54 FR 40607, Oct. 2, 1989]

§ 56.50–25 Safety and relief valve escape piping.

(a) Escape piping from unfired steam generator, boiler, and superheater safety valves shall have an area of not less than that of the combined areas of the outlets of all valves discharging thereto and shall be led as near vertically as practicable to the atmosphere.

(b) Expansion joints or flexible pipe connections shall be fitted in escape piping. The piping shall be adequately supported and installed so that no stress is transmitted to the safety valve body.

(c) Safety or relief valve discharges, when permitted to terminate in the machinery space, shall be led below the floorplates or to a remote position to minimize the hazardous effect of the escaping steam.

(d) The effect of the escape piping on the operation of the relief device shall be considered. The back pressure in the escape piping from the main propulsion steam generator should not exceed 10 percent of the relief device setting unless a compensated relief device is used. Back pressure must be calculated with all relief valves which discharge to a common escape pipe relieving simultaneously at full capacity.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 77–140, 54 FR 40608, Oct. 2, 1989; CGD 95–012, 60 FR 48050, Sept. 18, 1995]

§ 56.50–30 Boiler feed piping.

(a) *General requirements.* (1) Steam vessels, and motor vessels fitted with steam driven electrical generators shall have at least two separate means of supplying feed water for the boilers. All feed pumps shall be fitted with the necessary connections for this purpose. The arrangement of feed pumps shall be in accordance with paragraph (d) or (e) of this section.

(2) Feed pump supply to power boilers may utilize the group feed system or the unit feed system.

(3) Feed discharge piping from the pump up to, but not including the required stop and stop-check valves, shall be designed for either the feed pump relief valve setting or the shutoff head of the pump if a relief valve is not fitted. (Refer to § 56.07–10(b) for specific requirements.) Feed piping from the boiler, to and including the required stop and stop-check valves (see paragraph (b) of this section), shall have a design pressure which exceeds the maximum allowable working pressure of the boiler by either 25 percent or 225 pounds per square inch whichever is less. The value of allowable stress for design purposes shall be selected as described in § 56.07–10(e) at a temperature not below that for saturated steam at the maximum allowable working pressure of the boiler.

(4) Feed pumps for water tube boilers shall have fresh water connections only. Care shall be taken to prevent the accidental contamination of feed water from salt water or oil systems.

(b) *Feed valves.* (1) Stop and stop-check valves shall be fitted in the main feed line and shall be attached as close as possible to drum feed inlet nozzles or to the economizer feed inlet nozzles on boilers fitted with integral economizers.

(2) Where the installation will not permit the feed stop valve to be attached directly to the drum inlet nozzle on boilers not fitted with economizers, a distance piece may be installed between the stop valve and the inlet nozzle.

(3) Feed stop or stop-check valves may be located near the operating platform on boilers fitted with economizers provided the piping between the valves and the economizer, exclusive of the feed valves and the economizer inlet nozzles, is installed with a minimum of intervening flanged connections.

(4) Auxiliary feed lines shall be fitted with stop valves and stop-check valves. Boilers not having auxiliary feed water nozzles, or where independent auxiliary feed lines are not installed, shall have the auxiliary feed line to the drum or economizer connected to the main feed line as close as possible to the main

feed stop valves; and the valves in the auxiliary feed line shall be fitted as close as possible to the junction point.

(5) Boilers fitted with economizers shall have a check valve fitted in the economizer discharge and located as close as possible to the drum fed inlet nozzle. When economizer bypasses are fitted, a stop-check valve shall be installed in lieu of the aforementioned check valve.

(6) A sentinel valve is not required for vessels constructed after September 30, 1997, and for other vessels to which it has been shown to the satisfaction of the cognizant Officer in Charge, Marine Inspection or the Coast Guard Marine Safety Center, that a sentinel valve is not necessary for the safe operation of the particular boiler.

(c) *Feed water regulators, heaters, and grease extractors.* (1) Where feed water regulators, tubular feed water heaters, and grease extractors are installed, an alternate means of operation with these devices bypassed shall be provided.

(2) Feed water regulators designed with a built-in bypass for emergency use need not be fitted with an external bypass when installed in a feed system provided with an auxiliary feed line. All feed water regulators installed in a unit feed system shall be fitted with an external bypass. Feed water regulators bypasses shall be so arranged that the regular feed valves are in operation while the bypass is in use.

(3) A feed water regulator may be interposed between the stop and stop-check valves in the feed lines.

(d) *Group feed system.* Group feed systems shall be provided with pumps and piping as follows:

(1) Oceangoing and Great Lakes steam vessels, having a feed pump attached to the main propelling unit, shall be provided with at least one independently driven feed pump. Each of these pumps shall be used exclusively for feed purposes and shall be capable of supplying the operating boilers at their normal capacity. In addition, a second independently driven pump, capable of supplying such boilers at 75 percent of their normal capacity, shall be provided for emergency use. This second pump may be used for other purposes.

(2) If two independently driven pumps are provided, each capable of supplying the boilers at their normal required operating capacity, and neither of which is used for other purposes, the third or emergency feed pump is not required. Where more than two independently driven feed pumps are provided, their aggregate capacity shall not be less than 200 percent of that demanded by the boilers at their required normal operating capacity.

(3) River or harbor steam vessels shall have at least two means for feeding the boilers; one of which shall be an independently driven pump, the other may be an attached pump, an additional independently driven pump, or an injector.

(e) *Unit feed system.* Unit feed systems shall be provided with pumps and piping as follows:

(1) The unit feed system may be used on vessels having two or more boilers. When the unit feed system is employed each boiler shall have its own independently driven main feed pump capable of supplying the boiler at its normal operating capacity. In addition these shall be an auxiliary independently driven feed pump of the same capacity which can be operated in place of and in conjunction with the main feed pump. In vessels with three or more boilers, not more than two boilers may be served by any one auxiliary pump. The auxiliary pump may be so interconnected that any pump can feed any boiler.

(2) In the unit feed system, a separate feed line shall be provided for each boiler from its pumps. A separate auxiliary feed line is not required. The discharge from each pump and the feed supply to each boiler shall be automatically controlled by the level of the water in that boiler. In addition to the automatic control, manual control shall be provided.

(f) *Feedwater.* The feedwater shall be introduced into a boiler as required by §52.01–105(b) of this subchapter.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 95–028, 62 FR 51201, Sept. 30, 1997; USCG–2002–13058, 67 FR 61278, Sept. 30, 2002]

§ 56.50–35 Condensate pumps.

Two means shall be provided for discharging the condensate from the main condenser, one of which shall be mechanically independent of the main propelling machinery. If one of the independent feed pumps is fitted with a direct suction from the condenser and a discharge to the feed tank, it may be accepted as an independent condensate pump. On vessels operating on lakes (including Great Lakes), bays, sounds, or rivers, where provision is made to operate noncondensing, only one condensate unit will be required.

§ 56.50–40 Blowoff piping (replaces 102.2.5(d)).

(a)(1) The requirements for blowoff piping in this section shall be followed in lieu of the requirements in 102.2.5(d) in ANSI–B31.1.

(2) Where blowoff valves are connected to a common discharge from two or more boilers, a nonreturn valve shall be provided in the line from each boiler to prevent accidental blowback in the event the boiler blowoff valve is left open.

(b) Blowoff piping external to the boiler shall be designed for not less than 125 percent of the maximum allowable working pressure of the boiler, or the maximum allowable working pressure of the boiler plus 225 pounds per square inch, whichever is less. When the required blowoff piping design pressure exceeds 100 pounds per square inch gage, the wall thickness of the piping shall not be less than Schedule 80. The value of allowable stress for design purposes shall be selected as described in § 56.07–10(e) at a temperature not below that of saturated steam at the maximum allowable working pressure of the boiler.

(c) Boiler blowoff piping which discharges above the lightest loadline of a vessel shall be arranged so that the discharge is deflected downward.

(d) Valves such as the globe type so designed as to form pockets in which sediment may collect shall not be used for blowoff service.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 73–254, 40 FR 40165, Sept. 2, 1975]

§ 56.50–45 Circulating pumps.

(a) A main circulating pump and emergency means for circulating water through the main condenser shall be provided. The emergency means may consist of a connection from an independent power pump fitted between the main circulating pump and the condenser.

(b) Independent sea suctions shall be provided for the main circulating and the emergency circulating pumps.

(c) A cross connection between the circulating pumps in the case of multiple units will be acceptable in lieu of an independent power pump connection.

(d) On vessels operating on lakes (including Great Lakes), bays, sounds, or rivers, where provision is made to operate noncondensing, only one circulating unit will be required.

§ 56.50–50 Bilge and ballast piping.

(a)(1) All vessels except unmanned barges shall be provided with a satisfactory bilge pumping plant capable of pumping from and draining any watertight compartment except for ballast, oil and water tanks which have acceptable means for filling and emptying independent of the bilge system. The bilge pumping system shall be capable of operation under all practicable conditions after a casualty whether the ship is upright or listed. For this purpose wing suctions will generally be necessary except in narrow compartments at the ends of the vessel where one suction may be sufficient. In compartments of unusual form, additional suctions may be required.

(2) Arrangements shall be made whereby water in the compartments will drain to the suction pipes. Efficient means shall be provided for draining water from all tank tops, other watertight flats and insulated holds. Peak tanks, chain lockers and decks over peak tanks may be drained by eductors, ejectors, or hand pumps. Where piping is led through the forepeak, see § 56.50–1(b).

(3) Where drainage from particular compartments is considered undesirable, the provisions for such drainage may be omitted, provided it can be shown by calculations that the safety of the vessel will not be impaired.

(4) Where the vessel is to carry Class 3 flammable liquids with a flashpoint below 23 °C (74 °F), Class 6, Division 6.1, poisonous liquids, or Class 8 corrosive liquids with a flashpoint below 23 °C (74 °F) as defined in 49 CFR part 173, in enclosed cargo spaces, the bilge-pumping system must be designed to ensure against inadvertent pumping of such liquids through machinery-space piping or pumps.

(5) For each vessel constructed on or after June 9, 1995, and on an international voyage, arrangements must be made to drain the enclosed cargo spaces on either the bulkhead deck of a passenger vessel or the freeboard deck of a cargo vessel.

(i) If the deck edge, at the bulkhead deck of a passenger vessel or the freeboard deck of a cargo vessel, is immersed when the vessel heels 5° or less, the drainage of the enclosed cargo spaces must discharge to a space, or spaces, of adequate capacity, each of which has a high-water-level alarm and a means to discharge overboard. The number, size and arrangement of the drains must prevent unreasonable accumulation of water. The pumping arrangements must take into account the requirements for any fixed manual or automatic sprinkling system. In enclosed cargo spaces fitted with carbon-dioxide extinguishing systems, the drains must have traps or other means to prevent escape of the smothering gas. The enclosed cargo spaces must not drain to machinery spaces or other spaces where sources of ignition may be present if water may be contaminated with Class 3 flammable liquids; Class 6, Division 6.1, poisonous liquids; or Class 8 corrosive liquids with a flashpoint below 23 °C (74 °F).

(ii) If the deck edge, at the bulkhead deck of a passenger vessel or the freeboard deck of a cargo vessel, is immersed only when the vessel heels more than 5°, the drainage of the enclosed cargo spaces may be by means of a sufficient number of scuppers discharging overboard. The installation of scuppers must comply with §42.15–60 of this chapter.

(b) Passenger vessels shall have provision made to prevent the compartment served by any bilge suction piping from being flooded in the event the pipe is severed or otherwise damaged by collision or grounding in any other compartment. Where the piping is located within one-fifth of the beam of the side of the vessel (measured at right angles to the centerline at the level of the deepest subdivision loadline or deepest loadline where a subdivision loadline is not assigned) or is in a ductkeel, a nonreturn valve shall be fitted to the end of the pipe in the compartment which it serves.

(c)(1) Each bilge suction must lead from a manifold except as otherwise approved by the Commanding Officer, Marine Safety Center. As far as practicable, each manifold must be in, or be capable of remote operation from, the same space as the bilge pump that normally takes suction on that manifold. In either case, the manifold must be capable of being locally controlled from above the floorplates and must be easily accessible at all times. As far as practicable, each overboard-discharge valve for a bilge system must comply with the requirements governing location and accessibility for suction manifolds. Except as otherwise permitted by paragraph (c)(4) of this section for a vessel employing a common-rail bilge system, each bilge-manifold valve controlling a bilge suction from any compartment must be of the stop-check type.

(2) Each passenger vessel on an international voyage must comply with the provisions of SOLAS II–1/21.

(3) A common-rail bilge system may be installed as an acceptable alternative to the system required by paragraph (c)(1) of this section, provided it satisfies all of the following criteria:

(i) The common-rail main runs inboard at least one-fifth of the beam of the vessel.

(ii) A stop-check valve or both a stop valve and a check valve are provided in each branch line and located inboard at least one-fifth of the beam of the vessel.

(iii) The stop valve or the stop-check valve is power-driven, is capable of remote operation from the space where the pump is, and, regardless of the status of the power system, is capable of manual operation to both open and close the valve.

(iv) The stop valve or the stop-check valve is accessible for both manual operation and repair under all operating conditions, and the space used for access contains no expansion joint or flexible coupling that, upon failure, would cause flooding and prevent access to the valve.

(v) A port and a starboard suction serve each space protected unless, under the worst conditions of list and trim and with liquid remaining after pumping, the vessel's stability remains acceptable, in accordance with subchapter S of this chapter.

(vi) For each vessel designed for the carriage of combinations of both liquid and dry bulk cargoes (O/B/O), no bilge pump or piping is located in a machinery space other than in a pump room for cargo, and no liquid and other cargoes are carried simultaneously.

(vii) For each cargo vessel in Great Lakes service, each common-rail piping for the bilge and ballast system serving cargo spaces, if installed and if connected to a dedicated common-rail bilge system, must lead separately from a valved manifold located at the pump.

(d) The internal diameter of bilge suction pipes including strainers shall be determined by formulas (1) and (2), except that the nearest commercial size not more than one-fourth inch under the required diameter may be used. Bilge suction pipes shall be suitably faired to pump inlets.

(1) For suctions to each main bilge pump:

$$d = 1 + \sqrt{\frac{L(B+D)}{2500}} \quad (1) \quad (4) \quad (5)$$

(2) For branch suctions to cargo and machinery spaces:

$$d = 1 + \sqrt{\frac{c(B+D)}{1500}} \quad (2) \quad (3) \quad (5)$$

where:

L=Length of vessel on loadwater line, in feet.

B=Breadth of vessel, in feet. (5)

D=Molded depth (in feet) to the bulkhead deck. (6)

c=Length of compartment, in feet.

d=Required internal diameter of suction pipe, in inches.

NOTE 1—For tank vessels, "L" may be reduced by the combined length of the cargo oil tanks.

NOTE 2—For bulk carriers with full depth wing tanks served by a ballast system where the beam of the vessel is not representative of the breadth of the compartment, "B" may be appropriately modified to the breadth of the compartment.

NOTE 3—In the calculation for a vessel with more than one hull, such as a catamaran, the breadth of the unit is the breadth of one hull.

NOTE 4—In the calculation for a mobile offshore drilling unit, "L" is reducible by the combined length of spaces that can be pumped by another piping system meeting §§ 56.50–50 and 56.50–55, where "L" is the length of the unit at the waterline.

NOTE 5—For mobile offshore drilling units employing unusual hull forms, "B" may be modified to the average breadth rather than the maximum breadth.

NOTE 6—For each passenger vessel constructed on or after June 9, 1995, and being on an international voyage, D must be measured to the next deck above the bulkhead deck if an enclosed cargo space on the bulkhead deck that is internally drained in accordance with paragraph (a)(4) of this section extends the entire length of the vessel. Where the enclosed cargo space extends a lesser length, D must be taken as the sum of the molded depth (in feet) to the bulkhead deck plus lh/L where l and h are the aggregate length and height (in feet) of the enclosed cargo space.

(3) For vessels of 150 gross tons and over, no main suction piping shall be less than 2½ inches internal diameter. Branch piping need not be more than 4 inches and shall not be less than 2 inches in diameter except for drainage of small pockets or spaces in which case 1½-inch diameter may be used. For vessels less than 150 gross tons no bilge suction shall be less than 1½ inches internal diameter and no branch piping shall be less than 1 inch nominal pipe size.

(4) For vessels of 65 feet in length or less and not engaged on an international voyage, the bilge pipe sizes computed by Formulas (1) and (2) of this paragraph are not mandatory, but in no case shall the size be less than 1 inch nominal pipe size.

(5) The number, location, and size of bilge suctions in the boiler and machinery compartments shall be determined when the piping plans are submitted for approval and shall be based

upon the size of the compartments and the drainage arrangements.

(e) *Independent bilge suction.* One of the independent bilge pumps must have a suction of a diameter not less than that given by Formula (2) in paragraph (d) of this section that is led directly from the engine room bilge entirely independent of the bilge main, and on passenger vessels each independent bilge pump located in the machinery spaces must have such direct suctions from these spaces, except that not more than two pumps are required to have direct suctions from any one space. A suction that is led directly from a suitably located pump manifold may be considered to be independent of the bilge main. Where two direct suctions are required in any one compartment on passenger vessels, one suction must be located on each side of the compartment. If watertight bulkheads separate the engine and boiler rooms, a direct suction or suctions must be fitted to each compartment unless the pumps available for bilge service are distributed throughout these compartments, in which case at least one pump in each such compartment must be fitted with direct suction in its compartment. In a vessel with more than one hull, there must be one bilge pump that has an independent bilge suction in each hull. In a column stabilized mobile offshore drilling unit, the independent bilge suction must be from the pumproom bilge.

(f) *Emergency bilge suctions.* In addition to the independent bilge suction(s) required by paragraph (e) of this section, an emergency bilge suction must be provided in the machinery space for all self-propelled vessels as described in the following subparagraphs. Emergency suctions must be provided from pumps other than those required by §56.50–55(a) of this part. Such suctions must have nonreturn valves, and must meet the following criteria as appropriate:

(1) On passenger vessels propelled by steam and operating on an international voyage or on ocean, coastwise, or Great Lakes routes, the main circulating pump is to be fitted with a direct bilge suction for the machinery space. The diameter of such suctions shall not be less than two-thirds the diameter of the main sea injection. When it can be shown to the satisfaction of the Commandant that the main circulating pump is not suitable for emergency bilge service, a direct emergency bilge suction is to be led from the largest available independent power driven pump to the drainage level of the machinery space. The suction is to be of the same diameter as the main inlet of the pump used and the capacity of the pump shall exceed that of a required main bilge pump.

(2) On passenger vessels propelled by internal combustion engines and operating on an international voyage or on ocean, coastwise, or Great Lakes routes, the largest available pump in the engine room is to be fitted with the direct bilge suction in the machinery space except that a required bilge pump may not be used. The area of the suction pipe is to be equal to the full suction inlet of the pump. The discharge capacity of the pump selected shall exceed the capacity of the required main bilge pump.

(3) Vessels over 180 feet in length which are not passenger vessels and which operate on international voyages or in ocean, coastwise, or Great Lakes service, must be provided with a direct emergency bilge suction from any pump in the machinery space, except that a required bilge pump may not be used. The discharge capacity of the pump selected must exceed the capacity of the required main bilge pump and the area of the suction inlet is to be equal to the full suction inlet of the pump.

(4) Vessels under 180 feet in length need not provide an emergency bilge suction, except that passenger vessels shall comply with the requirements of paragraphs (f) (1) and (2) of this section.

(5) Each vessel with more than one hull must have an emergency bilge suction in each hull.

(6) Each column stabilized mobile offshore drilling unit must have—

(i) An emergency bilge suction in each hull; and

(ii) A remote control for the emergency pump and associated valves that can be operated from the ballast control room.

(g) Each individual bilge suction shall be fitted with a suitable bilge strainer having an open area of not less than three times at of the suction pipe. In addition a mud box or basket strainer shall be fitted in an accessible position between the bilge suction manifold and the pump.

(h) Pipes for draining cargo holds or machinery spaces must be separate from pipes which are used for filling or emptying tanks where water or oil is carried. Bilge and ballast piping systems must be so arranged as to prevent oil or water from the sea or ballast spaces from passing into cargo holds or machinery spaces, or from passing from one compartment to another, whether from the sea, water ballast, or oil tanks, by the appropriate installation of stop and non-return valves. The bilge and ballast mains must be fitted with separate control valves at the pumps. Except as allowed by paragraph (c)(4)(vii) of this section, piping for draining a cargo hold or machinery space must be separate from piping used for filling or emptying any tank where water or oil is carried. Piping for bilge and ballast must be arranged so as to prevent, by the appropriate installation of stop and non-return valves, oil or water from the sea or ballast spaces from passing into a cargo hold or machinery space, or from passing from one compartment to another, regardless of the source. The bilge and ballast mains must be fitted with separate control valves at the pumps.

(i) Ballast piping shall not be installed to any hull compartment of a wood vessel. Where the carriage of liquid ballast in such vessels is necessary, suitable ballast tanks, structurally independent of the hull, shall be provided.

(j) When dry cargo is to be carried in deep tanks, arrangement shall be made for disconnecting or blanking-off the oil and ballast lines, and the bilge suctions shall be disconnected or blanked-off when oil or ballast is carried. Blind flanges or reversible pipe fittings may be employed for this purpose.

(k) Where bilge and ballast piping is led through tanks, except ballast piping in ballast tanks, means must be provided to minimize the risk of flooding of other spaces due to pipe failure within the tanks. In this regard, such piping may be in an oiltight or watertight pipe tunnel, or the piping may be of Schedule 80 pipe wall thickness, fitted with expansion bends, and all joints within the tanks are welded. Alternative designs may be installed as approved by the Marine Safety Center. Where a pipe tunnel is installed, the watertight integrity of the bulkheads must be maintained. No valve or fitting may be located within the tunnel if the pipe tunnel is not of sufficient size to afford easy access. These requirements need not be met provided the contents of the tank and piping system are chemically compatible and strength and stability calculations are submitted showing that crossflooding resulting from a pipe, the tank, and the spaces through which the piping passes will not seriously affect the safety of the ship, including the launching of lifeboats due to the ship's listing. Bilge lines led through tanks without a pipe tunnel must be fitted with nonreturn valves at the bilge suctions.

(l) When bilge pumps are utilized for other services, the piping shall be so arranged that under any condition at least one pump will be available for drainage of the vessel through an overboard discharge, while the other pump(s) are being used for a different service.

(m) All bilge pipes used in or under fuel storage tanks or in the boiler or machinery space, including spaces in which oil settling tanks or oil pumping units are located, shall be of steel or other acceptable material.

(n) Oil pollution prevention requirements for bilge and ballast systems are contained in subpart B of part 155, Title 33, Code of Federal Regulations.

NOTE: For the purposes of this section, a pumproom is a machinery space on a column stabilized mobile offshore drilling unit.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970; CGD 73–58R, 39 FR 18767, May 30, 1974; 79–165a, 45 FR 64188, Sept. 29, 1980; CGD 77–140, 54 FR 40608, Oct. 2, 1989; 55 FR 39968, Oct. 1, 1990; CGD 83–043, 60 FR 24772, May 10, 1995; CGD 95–028, 62 FR 51201, Sept. 30, 1997]

§ 56.50–55 Bilge pumps.

(a) *Self-propelled vessels.* (1) Each self-propelled vessel must be provided with

a power-driven pump or pumps connected to the bilge main as required by Table 56.50–55(a).

TABLE 56.50–55(a)—POWER BILGE PUMPS REQUIRED FOR SELF-PROPELLED VESSELS

Vessel length, in feet	Passenger vessels [1]			Dry-cargo vessels [2]		Tank vessels	Mobile offshore drilling units
	International voyages [3]	Ocean, coastwise and Great Lakes	All other waters	Ocean, coastwise and Great Lakes	All waters	All waters	All waters
180′ or more	[4] 3	[4] 3	2	2	2	2	2
Below 180′ and exceeding 65′	[4] 3	[5] 2	[5] 2	[5] 2	[5] 2	2	2
65′ or less	3	1	1	1	1	1	

[1] Small passenger vessels under 100 gross tons refer to Subpart 182.520 of Subchapter T (Small Passenger Vessel) of this chapter.
[2] Dry-bulk carriers having ballast pumps connected to the tanks outside the engineroom and to the cargo hold may substitute the appropriate requirements for tank vessels.
[3] Not applicable to passenger vessels which do not proceed more than 20 mile from the nearest land, or which are employed in the carriage of large numbers of unberthed passengers in special trades.
[4] When the criterion numeral exceeds 30, an additional independent power-driven pump is required. (See Part 171 of this chapter for determination of criterion numeral.)
[5] Vessels operating on lakes (including Great Lakes), bays, sounds, or rivers where steam is always available, or where a suitable water supply is available from a power-driven pump of adequate pressure and capacity, may substitute siphons or eductors for one of the required power-driven pumps, provided a siphon or eductor is permanently installed in each hold or compartment.

(b) *Nonself-propelled vessels.* (1) Ocean going sailing vessels and barges shall be provided with pumps connected to the bilge main as required in Table 56.50–55(b)(1).

TABLE 56.50–55(b)(1)—BILGE PUMPS REQUIRED FOR NONSELF-PROPELLED VESSELS

Type of vessel	Waters navigated	Power pumps [(1)]	Hand pumps
Sailing	Ocean and coastwise	Two	[(2)]
Manned barges	.....do	Two	[(2)]
Manned barges	Other than ocean and coastwise	[(3)]	[(3)]
Unmanned barges	All waters	[(3)]	[(3)]
Mobile offshore drilling units	All waters	Two	None.

[1] Where power is always available, independent power bilge pumps shall be installed as required and shall be connected to the bilge main.
[2] Efficient hand pumps connected to the bilge main may be substituted for the power pumps. Where there is no common bilge main, one hand pump will be required for each compartment.
[3] Suitable hand or power pumps or siphons, portable or fixed, carried either on board the barge or on the towing vessel shall be provided.

(2) The pumps and source of power for operation on oceangoing sailing vessels and barges shall be located above the bulkhead deck or at the highest convenient level which is always accessible.

(3) Each hull of a vessel with more than one hull, such as a catamaran, must meet Table 56.50–55(b).

(c) *Capacity of independent power bilge pump.* Each power bilge pump must have the capacity to develop a suction velocity of not less than 400 feet per minute through the size of bilge main piping required by § 56.50–50(d)(1) of this part under ordinary conditions; except that, for vessels of less than 65 feet in length not engaged on international voyages, the pump must have a minimum capacity of 25 gallons per minute and need not meet the velocity requirement of this paragraph.

(d) *Priming.* Suitable means shall be provided for priming centrifugal pumps which are not of the self-priming type.

(e) *Location.* (1) For self-propelled vessels, if the engines and boilers are in two or more watertight compartments, the bilge pumps must be distributed throughout these compartments. On other self-propelled vessels and mobile offshore drilling units, the bilge pumps must be in separate compartments to the extent practicable. When the location of bilge pumps in separate watertight compartments is not practicable,

alternative arrangements may be submitted for consideration by the Marine Safety Center.

(2) For nonself-propelled vessels requiring two bilge pumps, these pumps, insofar as practicable, shall be located in separate watertight machinery spaces. When the location of bilge pumps in separate watertight compartments is not possible, the Commandant will consider alternate arrangements of the bilge pumps.

(3) The emergency bilge pumps shall not be installed in a passenger ship forward of the collision bulkhead.

(4) Each hull of a vessel with more than one hull must have at least two means for pumping the bilges in each hull. No multi-hulled vessel may operate unless one of these means is available to pump each bilge.

(f) *Other pumps.* Sanitary, ballast, and general service pumps having the required capacity may be accepted as independent power bilge pumps if fitted with the necessary connections to the bilge pumping system.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 79–023, 48 FR 51007, Nov. 4, 1983; CGD 77–140, 54 FR 40608, Oct. 2, 1989; 55 FR 39968, Oct. 1, 1990; CGD 83–043, 60 FR 24773, May 10, 1995; USCG–2004–18884, 69 FR 58346, Sept. 30, 2004]

§ 56.50–57 Bilge piping and pumps, alternative requirements.

(a) If a passenger vessel complies with §§ 171.075 and 171.082 of this chapter, its bilge pumping and piping systems must meet §§ 56.50–50 and 56.50–55, except as follows:

(1) Each bilge pumping system must comply with—

(i) Regulation 19(b) of the Annex to IMCO Resolution A.265 (VIII) in place of §§ 56.50–55(a)(1), 56.50–55(a)(3), and 56.50–55(f);

(ii) Regulation 19(d) of the Annex to IMCO Resolution A.265 (VIII) in place of § 56.50–55(a)(2).

(2) Each bilge main must comply with Regulation 19(i) of the Annex to IMCO Resolution A.265 (VIII) in place of § 56.50–50(d) except—

(i) The nearest commercial pipe size may be used if it is not more than one-fourth inch under the required diameter; and

(ii) Each branch pipe must comply with § 56.50–50(d)(2).

(b) The standards referred to in this section, which are contained in the Inter-governmental Maritime Consultative Organization (IMCO) Resolution A.265 (VIII), dated December 10, 1973, are incorporated by reference. This document is available from the National Technical Information Service, Springfield, Virginia, 22151, under the title "Regulations on Subdivision and Stability of Passenger Ships as Equivalent to part B of chapter II of the International Convention for the Safety of Life at Sea, 1960" (Volume IV of the U.S. Coast Guard's "Commandant's International Technical Series", USCG CITS–74–1–1.)

[CGD 76–053, 47 FR 37553, Aug. 26, 1982, as amended by CGD 79–023, 48 FR 51007, Nov. 4, 1983]

§ 56.50–60 Systems containing oil.

(a)(1) Oil-piping systems for the transfer or discharge of cargo or fuel oil must be separate from other piping systems as far as practicable, and positive means shall be provided to prevent interconnection in service.

(2) Fuel oil and cargo oil systems may be combined if the cargo oil systems contain only Grade E oils and have no connection to cargo systems containing grades of oil with lower flash points or hazardous substances.

(3) Pumps used to transfer oil must have no discharge connections to fire mains, boiler feed systems, or condensers unless approved positive means are provided to prevent oil from being accidentally discharged into any of the aforementioned systems.

(b) When oil needs to be heated to lower its viscosity, heating coils must be properly installed in each tank.

(1) Each drain from a heating coil as well as each drain from an oil heater must run to an open inspection tank or other suitable oil detector before returning to the feed system.

(2) As far as practicable, no part of the fuel-oil system containing heated oil under pressure exceeding 180 KPa (26 psi) may be placed in a concealed position so that defects and leakage cannot be readily observed. Each machinery space containing a part of the

system must be adequately illuminated.

(c) Filling pipes may be led directly from the deck into the tanks or to a manifold in an accessible location permanently marked to indicate the tanks to which they are connected. A shutoff valve must be fitted at each filling end. Oil piping must not be led through accommodation spaces, except that low pressure fill piping not normally used at sea may pass through accommodation spaces if it is of steel construction, all welded, and not concealed.

(d) Piping subject to internal head pressure from oil in the tank must be fitted with positive shutoff valves located at the tank.

(1) Valves installed on the outside of the oil tanks must be made of steel, ductile cast iron ASTM A395, or a ductile nonferrous alloy having a melting point above 1,700°F and must be arranged with a means of manual control locally at the valve and remotely from a readily accessible and safe location outside of the compartment in which the valves are located.

(i) In the special case of a deep tank in any shaft tunnel, piping tunnel, or similar space, one or more valves must be fitted on the tank, but control in the event of fire may be effected by means of an additional valve on the piping outside the tunnel or similar space. Any such additional valve installed inside a machinery space must be capable of being operated from outside this space.

(ii) [Reserved]

(2) If valves are installed on the inside of the tank, they may be made of cast iron and arranged for remote control only. Additional valves for local control must be located in the space where the system exits from the tank or adjacent tanks. Valves for local control outside the tanks must be made of steel, ductile cast iron ASTM A 395 (incorporated by reference, see §56.01–2), or a ductile nonferrous alloy having a melting point above 1,700°F.

(3) Power operated valves installed to comply with the requirements of this section must meet the following requirements:

(i) Valve actuators must be capable of closing the valves under all conditions, except during physical interruption of the power system (e.g., cable breakage or tube rupture). Fluid power actuated valves, other than those opened against spring pressure, must be provided with an energy storage system which is protected, as far as practicable, from fire and collision. The storage system must be used for no other purpose and must have sufficient capacity to cycle all connected valves from the initial valve position to the opposite position and return. The cross connection of this system to an alternate power supply will be given special consideration by the Marine Safety Center.

(ii) The valve shall have a local power actuator to both open and close the valve unless local manual opening operation will not prevent remote closing of the valve.

(iii) The positioning of the valve by either the local or remote actuators shall not void the ability of the other actuator to close the valve.

(iv) The valve shall be provided with a means of emergency manual operation to both open and close the valve regardless of the status of the power operating system. Such manual operation may interfere with the power operation, and if so, shall be protected from causal use by means of covers, locking devices, or other suitable means. Instructions and warnings regarding the emergency system shall be conspicuously posted at the valve.

(4) Remote operation for shutoff valves on small independent oil tanks will be specially considered in each case where the size of tanks and their location may warrant the omission of remote operating rods.

(e) Fuel oil tanks overhanging boilers are prohibited.

(f) Valves for drawing fuel or draining water from fuel are not permitted in fuel oil systems except that a single valve may be permitted in the case of diesel driven machinery if suitably located within the machinery space away from any potential source of ignition. Such a valve shall be fitted with a cap or a plug to prevent leakage.

(g) Test cocks must not be fitted to fuel oil or cargo oil tanks.

(h) Oil piping must not run through feed or potable water tanks. Feed or

potable water piping must not pass through oil tanks.

(i) Where flooding equalizing cross-connections between fuel or cargo tanks are required for stability considerations, the arrangement must be approved by the Marine Safety Center.

(j) Piping conveying oil must be run well away from hot surfaces wherever possible. Where such leads are unavoidable, only welded joints are to be used, or alternatively, suitable shields are to be fitted in the way of flanged or mechanical pipe joints when welded joints are not practicable. Piping that conveys fuel oil or lubricating oil to equipment and is in the proximity of equipment or lines having an open flame or having parts operating above 500°F must be of seamless steel. (See § 56.50–65 of this part.)

(k) Oil piping drains, strainers and other equipment subject to normal oil leakage must be fitted with drip pans or other means to prevent oil draining into the bilge.

(l) Where oil piping passes through a non-oil tank without stop valves complying with paragraph (d) of this section installed at all tank penetrations, the piping must comply with § 56.50–50(k).

(m) Each arrangement for the storage, distribution, and use of oil in a pressure-lubrication system must—

(1) As well as comply with § 56.50–80, be such as to ensure the safety of the vessel and all persons aboard; and

(2) In a machinery space, meet the applicable requirements of §§ 56.50–60 (b)(2) and (d), 56.50–85(a)(11), 56.50–90 (c) and (d), and 58.01–55(f) of this subchapter. No arrangement need comply with § 56.50–90 (c)(1) and (c)(3) of this subchapter if the sounding pipe is fitted with an effective means of closure, such as a threaded cap or plug or other means acceptable to the Officer in Charge, Marine Inspection. The use of flexible piping or hose is permitted in accordance with the applicable requirements of §§ 56.35–10, 56.35–15, and 56.60–25(c).

(n) Each arrangement for the storage, distribution, and use of any other flammable oil employed under pressure in a power transmission-system, control and activating system, or heating system must be such as to ensure the safety of the vessel and all persons aboard by—

(1) Complying with Subpart 58.30 of this subchapter; and,

(2) Where means of ignition are present, meeting the applicable requirements of §§ 56.50–85(a)(11), 56.50–90 (c) and (d), and 58.01–55(f) of this subchapter. Each pipe and its valves and fittings must be of steel or other approved material, except that the use of flexible piping or hose is permitted in accordance with the applicable requirements of §§ 56.35–10, 56.35–15, and 56.60–25(c).

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CGD 77–140, 54 FR 40609, Oct. 2, 1989; 55 FR 39968, Oct. 1, 1990; CGD 83–043, 60 FR 24774, May 10, 1995; USCG–2000–7790, 65 FR 58460, Sept. 29, 2000; USCG–2004–18884, 69 FR 58346, Sept. 30, 2004]

§ 56.50–65 Burner fuel-oil service systems.

(a) All discharge piping from the fuel oil service pumps to burners must be seamless steel with a thickness of at least Schedule 80. If required by § 56.07–10(e) of this part or paragraph 104.1.2 of ANSI B31.1, the thickness must be greater than Schedule 80. Short lengths of steel, or annealed copper nickel, nickel copper, or copper pipe and tubing may be used between the fuel oil burner front header manifold and the atomizer head to provide flexibility. All material used must meet the requirements of subpart 56.60 of this part. The use of non-metallic materials is prohibited. The thickness of the short lengths must not be less than the larger of 0.9 mm (0.35 inch) or that required by § 56.07–10(e) of this part. Flexible metallic tubing for this application may be used when approved by the Marine Safety Center. Tubing fittings must be of the flared type except that flareless fittings of the nonbite type may be used when the tubing is steel, nickel copper or copper nickel.

(b)(1) All vessels having oil fired boilers must have at least two fuel service pumps, each of sufficient capacity to supply all the boilers at full power, and arranged so that one may be overhauled while the other is in service. At

least two fuel oil heaters of approximately equal capacity must be installed and so arranged that any heater may be overhauled while the other(s) is (are) in service. Suction and discharge strainers must be of the duplex or other type capable of being cleaned without interrupting the oil supply.

(2) All auxiliary boilers, except those furnishing steam for vital equipment and fire extinguishing purposes other than duplicate installations, may be equipped with a single fuel oil service pump and a single fuel oil heater. Such pumps need not be fitted with discharge strainers.

(3) Strainers must be located so as to preclude the possibility of spraying oil on the burner or boiler casing, or be provided with spray shields. Coamings, drip pans, etc., must be fitted under fuel oil service pumps, heaters, etc., where necessary to prevent oil drainage to the bilge.

(4) Boilers burning fuel oils of low viscosity need not be equipped with fuel oil heaters, provided acceptable evidence is furnished to indicate that satisfactory combustion will be obtained without the use of heaters.

(c) Piping between service pumps and burners shall be located so as to be readily observable, and all bolted flange joints shall be provided with a wrap around deflector to deflect spray in case of a leak. The relief valve located at the pump and the relief valves fitted to the fuel oil heaters shall discharge back into the settling tank or the suction side of the pump. The return line from the burners shall be so arranged that the suction piping cannot be subjected to discharge pressure.

(d) If threaded-bonnet valves are employed, they shall be of the union-bonnet type capable of being packed under pressure.

(e) Unions shall not be used for pipe diameters of 1 inch and above.

(f) Boiler header valves of the quick closing type shall be installed in the fuel supply lines as close to the boiler front header as practicable. The location is to be accessible to the operator or remotely controlled.

(g) Bushings and street ells are not permitted in fuel oil discharge piping.

(h) Each fuel-oil service pump must be equipped with controls as required by §58.01–25 of this subchapter.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 77–140, 54 FR 40609, Oct. 2, 1989; CGD 83–043, 60 FR 24774, May 10, 1995]

§56.50–70 Gasoline fuel systems.

(a) *Material.* (1) Fuel supply piping to the engines shall be of seamless drawn annealed copper pipe or tubing, nickel copper, or copper nickel pipe or tubing meeting the requirements of subpart 56.60.

(2) Tubing wall thicknesses shall not be less than the larger of that shown in Table 56.50–70(a), or as required by §56.07–10(e) and 104.1.2 of ANSI–B31.1.

(3) Tubing fittings shall be of nonferrous drawn or forged metal and of the flared type except that the flareless fittings of the nonbite type may be used when the tubing system is of nickel copper or copper nickel. Tubing shall be cut square and flared by suitable tools. Tube ends shall be annealed before flaring. Pipe fittings shall be of nonferrous material. Pipe thread joints shall be made tight with a suitable compound.

(4) Valves for fuel lines shall be of nonferrous material of the union bonnet type with ground seats except that cocks may be used if they are the solid bottom type with tapered plugs and union bonnets.

TABLE 56.50–70(a)—TUBING WALL THICKNESS

Outside diameter of tubing in inches	Thickness	
	B.W.G.	Inch
1/8, 3/16, 1/4	#21	0.032
5/16, 3/8	#20	.035
7/16, 1/2	#19	.042

(b) *Installation.* (1) All fuel pipes, pipe connections, and accessories shall be readily accessible. The piping shall run in sight wherever practicable, protected against mechanical injury, and effectively secured against excessive movement and vibration by the use of soft nonferrous metal liners or straps without sharp edges. Where passing through steel decks or bulkheads, fuel lines shall be protected by close fitting ferrules or stuffing boxes. Refer to §56.30–25 for tubing joint installations.

(2) A short length of suitable metallic or nonmetallic flexible tubing or hose, or a loop of annealed copper tubing shall be installed in the fuel supply line at or near the engine to prevent damage by vibration. If nonmetallic flexible hose is used it shall meet the requirements of §56.60–25(b) for fuel service. Flexible hose connections should maintain metallic contact between the sections of the fuel supply lines; however, if such contact is not maintained, the fuel tank shall be grounded.

(3) Valves in fuel lines shall be installed to close against the flow.

(c) *Shutoff valves.* Shutoff valves of a suitable type shall be installed in the fuel supply lines, one as close to each tank as practicable, and one as close to each carburetor as practicable. Where fuel tanks are installed below the weather deck, arrangements shall be provided for operating all shutoff valves at the tanks from outside the compartments in which they are located, preferably from an accessible position on the weather deck. The operating gear for the shutoff valves at the tanks shall be accessible at all times and shall be suitably marked.

(d) *Strainers.* A suitable twin strainer shall be fitted in the fuel supply line in the engine compartment. Strainers shall be of the type opening on top for cleaning screens. A drip pan shall be fitted under the strainer.

(e) *Outlets and drains.* Outlets in fuel lines for drawing gasoline for any purpose are prohibited. Valved openings in the bottom of fuel tanks are prohibited; however, openings fitted with threaded plug or cap can be used for cleaning purposes.

(f) *Fuel suction connections.* All fuel suction and return lines shall enter the top of the fuel tanks and connections shall be fitted into spuds. Such lines shall extend nearly to the bottom of the tank.

(g) *Filling and sounding pipes.* Filling and sounding pipes shall be so arranged that vapors or possible overflow when filling cannot escape to the inside of the vessel but will discharge overboard. Such pipes shall terminate on the weather deck clear of any coamings and shall be fitted with suitable shutoff valves or deck plugs. Filling and sounding pipes shall extend to within one-half of their diameter from the bottom of the tank or from the surface of the striking plate in case of a sounding pipe. A flame screen of noncorrodible wire mesh shall be fitted in the throat of the filling pipe. Sounding pipes shall be kept closed at all times except during sounding.

(h) *Vent pipes.* Each tank shall be fitted with a vent, the cross-sectional area of which shall not be less than that of the filling pipe. The vent pipes shall terminate at least 2 feet above the weather deck and not less than 3 feet from any opening into living quarters or other below deck space. The ends of vent pipes shall terminate with U-bends and shall be fitted with flame screens or flame arresters. The flame screens shall consist of a single screen of corrosion resistant wire of at least 30 by 30 mesh.

(i) *Gasoline tanks.* For requirements pertaining to independent gasoline fuel tanks see subpart 58.50 of this subchapter.

(j) *Fuel pumps.* Each fuel pump must be equipped with controls as required by §58.01–25 of this subchapter.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGFR 72–59R, 37 FR 6189, Mar. 25, 1972; CGD 83–043, 60 FR 24774, May 10, 1995; USCG–2002–13058, 67 FR 61278, Sept. 30, 2002]

§56.50–75 Diesel fuel systems.

(a) *Vessels greater than 100 gross tons.* (1) The diesel fuel system shall comply with §§56.50–60, 56.50–85, and 56.50–90. The fuel supply piping to engines shall be of seamless steel, annealed seamless copper or brass pipe or tubing, or of nickel copper or copper nickel alloy meeting the requirements of subpart 56.60 for materials and §56.50–70(a)(2) for thickness. Fuel oil service or unit pumps shall be equipped with controls to comply with §58.01–25 of this subchapter.

(2) The installation shall comply with §56.50–70(b).

(3) Tubing connections and fittings shall be drawn or forged metal of the flared type except that flareless fittings of the nonbite type may be used when the tubing system is steel, nickel-copper, or copper-nickel. When making flared tube connections the tubing

shall be cut square and flared by suitable tools. Tube ends shall be annealed before flaring.

(b) *Vessels of 100 gross tons and less and tank barges.* (1) *Materials.* Fuel supply piping shall be of copper, nickel copper or copper nickel having a minimum wall thickness of 0.035 inch except that piping of other materials such as seamless steel pipe or tubing which provides equivalent safety may be used.

(2) *Tubing connections and fittings.* Tubing connections shall comply with the provisions of §56.50–75(a)(3).

(3) *Installation.* The installation of diesel fuel piping shall comply with the requirements of §56.50–70(b).

(4) *Shutoff valves.* Shutoff valves shall be installed in the fuel supply lines, one as close to each tank as practicable, and one as close to each fuel pump as practicable. Valves shall be accessible at all times.

(5) *Outlets and drains.* Valves for removing water or impurities from fuel oil systems will be permitted in the machinery space provided such valves are fitted with caps or plugs to prevent leakage.

(6) *Filling pipe.* Tank filling pipes on motorboats and motor vessels of less than 100 gross tons and tank barges shall terminate on an open deck and shall be fitted with suitable shutoff valves, deck plugs, or caps.

(7) *Vent pipes.* Each tank shall be fitted with a vent pipe complying with §56.50–85.

(8) *Independent diesel fuel tanks.* See subpart 58.50 of this subchapter for specific requirements.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 77–140, 54 FR 40610, Oct. 2, 1989]

§56.50–80 Lubricating-oil systems.

(a) The lubricating oil system shall be designed to function satisfactorily when the vessel has a permanent 15° list and a permanent 5° trim.

(b) When pressure or gravity-forced lubrication is employed for the steam driven main propelling machinery, an independent auxiliary lubricating pump shall be provided.

(c) Oil coolers on steam driven machinery shall be provided with two separate means of circulating water through the coolers.

(d) For internal combustion engine installations, the requirements of paragraphs (b) and (c) of this section shall be met, but they do not apply to vessels in river and harbor service, nor to any vessel below 300 gross tons. Where the size and design of an engine is such that lubrication before starting is not necessary and an attached pump is normally used, the independent auxiliary pump is not required if a duplicate of the attached pump is carried as spare. In meeting the requirements of paragraph (c) of this section in the case of internal combustion engines, two separate means are to be provided for circulating coolant on those engines on which oil coolers are fitted. One of those means must be independently driven and may consist of a connection from a pump of adequate size normally used for other purposes utilizing the required coolant. Where the design of an engine will not readily accommodate an independent pump connection, the independent auxiliary pump will not be required if a duplicate of the attached pump is carried as a spare. Oil filters shall be provided on all internal combustion engine installations. On main propulsion engines which are fitted with full-flow type filters, the arrangement shall be such that the filters may be cleaned without interrupting the oil supply except that such an arrangement is not required on vessels having more than a single main propulsion engine.

(e) The lubricating oil piping shall be independent of other piping systems and shall be provided with necessary coolers, heaters, filters, etc., for proper operation. Oil heaters shall be fitted with bypasses.

(f) Diesel engine lubrication systems shall be so arranged that vapors from the sump tank may not be discharged back into the engine crank case of engines of the dry sump type.

(g) Steam turbine driven propulsion and auxiliary generating machinery depending on forced lubrication shall be arranged to shut down automatically upon failure of the lubricating system.

(h) Sight-flow glasses may be used in lubricating-oil systems provided it has been demonstrated, to the satisfaction

of the Commanding Officer, Marine Safety Center, that they can withstand exposure to a flame at a temperature of 927 °C (1700 °F) for one hour, without failure or appreciable leakage.

(i) Steam driven propulsion machinery must be provided with an emergency supply of lubricating oil that must operate automatically upon failure of the lubricating oil system. The emergency oil supply must be adequate to provide lubrication until the equipment comes to rest during automatic shutdown.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970; CGD 81–030, 53 FR 17837, May 18, 1988; CGD 83–043, 60 FR 24774, May 10, 1995]

§ 56.50–85 Tank-vent piping.

(a) This section applies to vents for all independent, fixed, non-pressure tanks or containers or for spaces in which liquids, such as fuel, ship's stores, cargo, or ballast, are carried.

(1) The structural arrangement in double bottom and other tanks shall be such as to permit the free passage of air and gases from all parts of the tanks to vent pipes.

(2) Tanks having a comparatively small surface, such as fuel oil settling tanks, need be fitted with only one vent pipe, but tanks having a comparatively large surface shall be fitted with at least two vent pipes. The vents shall be located so as to provide venting of the tanks under any service condition.

(3) Vent pipes for fuel oil tanks shall, wherever possible, have a slope of no less than 30°. Header lines, where both ends are adequately drained to a tank, are excluded from this requirement.

(4) Tank vents must extend above the weather deck, except vents from fresh water tanks, bilge oily-water holding tanks, bilge slop tanks, and tanks containing Grade E combustible liquids, such as lubricating oil, may terminate in the machinery space, provided—

(i) The vents are arranged to prevent overflow on machinery, electrical equipment, and hot surfaces;

(ii) Tanks containing combustible liquids are not heated; and

(iii) The vents terminate above the deep load waterline if the tanks have boundaries in common with the hull.

(5) Vents from oil tanks must terminate not less than three feet from any opening into living quarters.

(6) Vents extending above the freeboard deck or superstructure deck from fuel oil and other tanks must be at least Schedule 40 in wall thickness. Except for barges in inland service and for Great Lakes vessels, the height from the deck to any point where water may gain access through the vent to below deck must be at least 30 inches (760mm) on the freeboard deck and 17½ inches (450mm) on the superstructure deck. On Great Lakes vessels, the height from the deck to any point where water may gain access through the vent to below deck must be at least 30 inches (760mm) on the freeboard deck, 24 inches (610mm) on the raised quarterdeck, and 12 inches (305mm) on other superstructure decks. Where the height of vents on Great Lakes vessels may interfere with the working of the vessel, a lower height may be approved by the Marine Safety Center provided the vent cap is properly protected from mechanical damage. For barges in inland service, the vents must extend at least six inches above the deck. A lesser amount may be approved by the Marine Safety Center if evidence is provided that a particular vent has proven satisfactory in service.

(7) Satisfactory means, permanently attached, shall be provided for closing the openings of all vents, except that barges in inland service may be exempted. Acceptable means of closure are:

(i) A ball check valve where the ball float, normally in the open position, will float up and close under the action of a submerging wave. The valve shall be designed so that the effective clear discharge area through the valve with the float in the open position is not less than the inlet area of the vent pipe to which the valve is connected.

(ii) A hinged closure normally open on the outlet of the return bend, which must close automatically by the force of a submerging wave; or

(iii) Another suitable device acceptable to the Commanding Officer, Marine Safety Center.

(8) Vent outlets from all tanks which may emit flammable or combustible

vapors, such as bilge slop tanks and contaminated drain tanks, must be fitted with a single screen of corrosion-resistant wire of at least 30 by 30 mesh, or two screens of at least 20 by 20 mesh spaced not less than one-half inch (13mm) nor more than 1½ inches (38mm) apart. The clear area through the mesh must not be less than the internal unobstructed area of the required pipe.

(9) Where vents are provided with flame screens, the closure device shall be situated so as not to damage these screens.

(10) The diameter of each vent pipe must not be less than 1½ inches nominal pipe size for fresh water tanks, 2 inches nominal pipe size for water ballast tanks, and 2½ inches nominal pipe size for fuel oil tanks, except that small independent tanks need not have a vent more than 25% greater in cross-sectional area than the fill line.

(11)(i) If a tank may be filled by a pressure head exceeding that for which the tank is designed, the aggregate cross-sectional area of the vents in each tank must be not less than the cross-sectional area of the filling line unless the tank is protected by overflows, in which case the aggregate cross-sectional area of the overflows must be not less than the cross-sectional area of the filling line.

(ii) Provision must be made to guard against liquids rising in the venting system to a height that would exceed the design head of a cargo tank or fuel-oil tank. It may be made by high-level alarms or overflow-control systems or other, equivalent means, together with gauging devices and procedures for filling cargo tanks.

(12) Where deep tanks are intended for the occasional carriage of dry or liquid cargo, a "spectacle" or ring and blank flange may be fitted in the overflow pipe so arranged as not to interfere with venting when the tanks contain oil.

(13) Vents from fresh water or water ballast tanks shall not be connected to a common header with vents from oil or oily ballast tanks.

(b) Tank vents must remain within the watertight subdivision boundaries in which the tanks they vent are located. Where the structural configuration of a vessel makes meeting this requirement impracticable, the Marine Safety Center may permit a tank vent to penetrate a watertight subdivision bulkhead. All tank vents which penetrate watertight subdivision bulkheads must terminate above the weather deck.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 77–140, 54 FR 40610, Oct. 2, 1989; CGD 83–043, 60 FR 24774, May 10, 1995; CGD 95–012, 60 FR 48050, Sept. 18, 1995]

§56.50–90 Sounding devices.

(a) Each tank must be provided with a suitable means of determining liquid level. Except for a main cargo tank on a tank vessel, each integral hull tank and compartment, unless at all times accessible while the vessel is operating, must be fitted with a sounding pipe.

(b) Where sounding pipes terminate below the freeboard deck on cargo vessels, they shall be fitted with gate valves. On passenger vessels, where sounding pipes terminate below the bulkhead deck, they shall be fitted with self-closing gate valves.

(c) Except as allowed by this paragraph, on each vessel constructed on or after June 9, 1995, no sounding pipe used in a fuel-oil tank may terminate in any space where the risk of ignition of spillage from the pipe might arise. None may terminate in a space for passengers or crew. When practicable, none may terminate in a machinery space. When the Commanding Officer, Marine Safety Center, determines it impracticable to avoid terminating a pipe in a machinery space, a sounding pipe may terminate in a machinery space if all the following requirements are met:

(1) In addition to the sounding pipe, the fuel-oil tank has an oil-level gauge complying with paragraph (d) of this section.

(2) The pipe terminates in a place remote from ignition hazards unless precautions are taken such as fitting an effective screen (shield) to prevent the fuel oil, in case of spillage through the end of the pipe, from coming into contact with a source of ignition.

(3) The end of the pipe is fitted with a self-closing blanking device and a small-diameter, self-closing control cock located below the blanking device

for the purpose of ascertaining before the blanking device is opened that no fuel oil is present. Provision must be made to ensure that no spillage of fuel oil through the control cock involves an ignition hazard.

(d) On each vessel constructed on or after June 9, 1995, other oil-level gauges may be used instead of sounding pipes if all the following requirements are met:

(1) In a passenger vessel, no such gauge may require penetration below the top of the tank, and neither the failure of a gauge nor an overfilling of the tank may permit release of fuel into the space.

(2) In a cargo vessel, neither the failure of such a gauge nor an overfilling of the tank may permit release of fuel into the space. The use of cylindrical gauge-glasses is prohibited. The use of oil-level gauges with flat glasses and self-closing valves between the gauges and fuel tanks is acceptable.

(e) The upper ends of sounding pipes terminating at the weather deck shall be closed by a screw cap or plug. Great Lakes dry cargo carriers may have the sounding pipes which service ballast water tanks terminate at least 4 inches above the deck if closure is provided by a tight fitting hinged cover making metal-to-metal contact with the hinge on the forward side. Positive means to secure these caps in the closed position shall be provided. Provision shall be made to prevent damage to the vessels' plating by the striking of the sounding rod.

(f) On mobile offshore drilling units where installation of sounding pipes may not be practicable for some tanks, alternate means of determining liquid level may be used if approved by the Commandant.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 73–251, 43 FR 56800, Dec. 4, 1978; CGD 83–043, 60 FR 24774, May 10, 1995; CGD 95–028, 62 FR 51201, Sept. 30, 1997]

§ 56.50–95 Overboard discharges and shell connections.

(a)(1) All inlets and discharges led through the vessel's side shall be fitted with efficient and accessible means, located as close to the hull penetrations as is practicable, for preventing the accidental admission of water into the vessel either through such pipes or in the event of fracture of such pipes.

(2) The number of scuppers, sanitary discharges, tank overflows, and other similar openings in the vessel's side shall be reduced to a minimum, either by making each discharge serve for as many as possible of the sanitary and other pipes, or in any other satisfactory manner.

(3) In general, when the bulkhead deck is above the freeboard deck, the requirements of this section apply relative to the bulkhead deck. For vessels not assigned load lines, such as certain inland vessels and barges, the weather deck shall be taken as the freeboard deck.

(b)(1) Scuppers and discharge pipes originating at any level and penetrating the shell either more than 17½ inches (450mm) below the freeboard deck or less than 23½ inches (600mm) above the summer load waterline must be provided with an automatic nonreturn valve at the shell. This valve, unless required by paragraph (b)(2) of this section, may be omitted if the piping is not less than Schedule 80 in wall thickness for nominal pipe sizes through 8 inches, Schedule 60 for nominal pipe sizes above 8 inches and below 16 inches, and Schedule 40 for nominal pipe sizes 16 inches and above.

(2) Discharges led through the shell originating either from spaces below the freeboard deck or from within enclosed superstructures and equivalent deckhouses on the freeboard deck as defined in §42.13–15(i) of subchapter E (Load Lines) of this chapter, shall be fitted with efficient and accessible means for preventing water from passing inboard. Normally each separate discharge shall have one automatic nonreturn valve with a positive means of closing it from a position above the freeboard deck. Where, however, the vertical upward distance from the summer load line to the inboard end of the discharge pipe through which flooding can take place exceed 0.01L, the discharge may have two automatic nonreturn valves without positive means of closing, provided that the inboard valve is always accessible for examination under service conditions. Where that vertical distance exceeds 0.02L a

single automatic nonreturn valve without positive means of closing is acceptable. In an installation where the two automatic nonreturn valves are used, the inboard valve must be above the tropical load line. The means for operating the positive action valve shall be readily accessible and provided with an indicator showing whether the valve is open or closed. A suitable arrangement shall be made to insure the valve is not closed by unauthorized persons, and a notice shall be posted in a conspicuous place at the operating station to the effect that the valve shall not be closed except as required in an emergency.

(3) Where scuppers and drains are installed in superstructures or deckhouses not enclosed as defined in §42.13–15(j) of subchapter E (Load Lines) of this chapter, they shall be led overboard. Refer to paragraph (b)(1) of this section for any nonreturn valve requirement.

(4) Sanitary pump discharges leading directly overboard or via a holding tank must meet the standards prescribed by this paragraph. The location of the sanitary system openings within the vessel determines whether the requirements of paragraph (b)(2) or (3) of this section are applicable.

(c) Overflow pipes which discharge through the vessel's side must be located as far above the deepest load line as practicable and fitted with valves as required by paragraph (b) of this section. Two automatic nonreturn valves must be used unless it is impracticable to locate the inboard valve in an accessible position, in which case a nonreturn valve with a positive means of closure from a position above the freeboard deck will be acceptable. Overflows which extend at least 30 inches above the freeboard deck before discharging overboard may be fitted with a single automatic nonreturn valve at the vessel's side. Overflow pipes which serve as tank vents must not be fitted with positive means of closure without the specific approval of the Marine Safety Center. Overflow pipes may be vented to the weather.

(d)(1) Sea inlets and discharges, such as used in closed systems required for the operation of main and auxiliary machinery, as in pump connections or scoop injection heat exchanger connections, need not meet the requirements of paragraphs (b) (1) and (2) of this section but instead shall be fitted with a shutoff valve located as near the shell plating as practicable, and may be locally controlled if the valve is located in a manned machinery space. These controls shall be readily accessible above the floor plates and shall be provided with indication showing whether the valve is opened or closed. Manned machinery spaces include the main machinery space and are either attended by the crew or are automated in accordance with part 62 of this subchapter to be comparable to an attended space.

(2) In unmanned machinery spaces, all machinery inlets and discharges as described in paragraph (d)(1) of this section shall be remotely operable from a position above the freeboard deck unless otherwise approved and shall meet the access and marking requirements of paragraph (b)(2) of this section.

(e)(1) Pipes terminating at the shell plating shall be fitted with bends or elbows between the outboard openings and the first rigid connection inboard. In no case shall such pipes be fitted in a direct line between the shell opening and the first inboard connection.

(2) Seachests and other hull fittings shall be of substantial construction and as short as possible. They shall be located as to minimize the possibility of being blocked or obstructed.

(3) The thickness of inlet and discharge connections outboard of the shutoff valves, and exclusive of seachests, must be not less than that of Schedule 80 for nominal pipe sizes through 8 inches, Schedule 60 for nominal pipe sizes above 8 inches and below 16 inches, and Schedule 40 for nominal pipe sizes 16 inches and above.

(f) Valves required by this section and piping system components outboard of such required valves on new vessel installations or replacements in vessels of 150 gross tons and over shall be of a steel, bronze, or ductile cast iron specification listed in Table 56.60–1(a). Lead or other heat sensitive materials having a melting point of 1,700 °F. or less shall not be used in such service, or in any other application where the deterioration of the piping system

in the event of fire would give rise to danger of flooding. Brittle materials such as cast iron shall not be used in such service. Where nonmetallic materials are used in a piping system, and shell closures are required by this section, a positive closure metallic valve is required (see also § 56.60–25).

(g) The inboard openings of ash and rubbish-chute discharges shall be fitted with efficient covers. If the inboard opening is located below the freeboard deck, the cover shall be watertight, and in addition, an automatic nonreturn valve shall be fitted in the chute in any easily accessible position above the deepest load line. Means shall be provided for securing both the cover and the valve when the chute is not in use. When ash-ejectors or similar expelling devices located in the boilerroom have the inboard openings below the deepest load line, they shall be fitted with efficient means for preventing the accidental admission of water. The thickness of pipe for ash ejector discharge shall be not less than Schedule 80.

(h) Where deck drains, soil lines, and sanitary drains discharge through the shell in way of cargo tanks on tank vessels, the valves required by this section shall be located outside the cargo tanks. These valves shall meet the material requirements of paragraph (f) of this section. The piping led through such tanks shall be fitted with expansion bends where required, and shall be of steel pipe having a wall thickness of not less than five-eighths inch, except that the use of suitable corrosion-resistant material of lesser thickness will be given special consideration by the Commandant. All pipe joints within the tanks shall be welded. Soil lines and sanitary drains which pass through cargo tanks shall be provided with nonreturn valves with positive means of closing or other suitable means for preventing the entrance of gases into living quarters.

(i) Except as provided for in § 58.20–20(c) of this chapter, sea valves must not be held open with locks. Where it is necessary to hold a discharge or intake closed with a lock, either a locking valve may be located inboard of the sea valve, or the design must be such that there is sufficient freedom of motion to fully close the locked sea valve after an event, such as fire damage to the seat, causes significant leakage through the valve. Valves which must be opened in and emergency, such as bilge discharges or fire pump suctions must not be locked closed, whether they are sea valves or not.

[CGFR 68–82, 33 FR 18843; Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970; CGFR 72–59R, 37 FR 6189, Mar. 25, 1972; CGD 81–030, 53 FR 17837, May 18, 1988; CGD 77–140, 54 FR 40610, Oct. 2, 1989]

§ 56.50–96 Keel cooler installations.

(a) Keel cooler installations shall meet the requirements of § 56.50–95(d)(1) and (2), and (e)(3), and (f) except that shutoff or isolation valves will not be required for the inlet and discharge connections if:

(1) The installation is forward of the collision bulkhead; or,

(2) The installation is integral with the ship's hull such that the cooler tubes are welded directly to the hull of the vessel with the hull forming part of the tube and satisfies all of the following:

(i) The cooler structure is fabricated from material of the same thickness and quality as the hull plating to which it is attached except that in the case of half round pipe lesser thickness may be used if specifically approved by the Commandant. In any case the structure, with the exception of the hull proper, need not exceed three-eighths inch in thickness.

(ii) The flexible connections and all openings internal to the vessel, such as expansion tank vents and fills, in the installation are above the deepest load line and all piping components are Schedule 80 or thicker below the deepest load line.

(iii) Full penetration welds are employed in the fabrication of the structure and its attachment to the hull.

(iv) The forward end of the structure must be faired to the hull such that the horizontal length of the fairing is no less than four times the height of the structure, or be in a protected location such as inside a bow thruster trunk.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 72–59R, 37 FR 6189, Mar. 25, 1972; CGD 77–140, 54 FR 40611, Oct. 2, 1989]

§56.50–97 Instrument, control and sampling piping (modifies 122.3).

(a) Instrument, control and sampling piping must comply with paragraph 122.3 of ANSI–B31.1 except that:

(1) Soldered type fittings may not be used.

(2) The outside diameter of takeoff connections may not be less than 0.840 inches for service conditions up to 900 psi or 800 °F., and 1.050 inches for conditions that exceed either of these limits.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 73–254, 40 FR 40165, Sept. 2, 1975]

§56.50–103 Fixed oxygen-acetylene distribution piping.

(a) This section applies to fixed piping installed for the distribution of oxygen and acetylene carried in cylinders as vessels stores.

(b) The distribution piping shall be of at least standard wall thickness and shall include a means, located as close to the supply cylinders as possible, of regulating the pressure from the supply cylinders to the suitable pressure at the outlet stations.

(c) Acetylene distribution piping and pipe fittings must be seamless steel. Copper alloys containing less than 65 percent copper may be used in connection with valves, regulators, gages, and other equipment used with acetylene.

(d) Oxygen distribution piping and pipe fittings must be seamless steel or copper.

(e) When more than two cylinders are connected to a manifold, the supply pipe between each cylinder and manifold shall be fitted with a non-return valve.

(f) Except for the cylinder manifolds, acetylene is not to be piped at a pressure in excess of 100 kPa (14.7 psi).

(g) Pipe joints on the low pressure side of the regulators shall be welded.

(h) Branch lines shall not run through unventilated spaces or accommodation spaces.

(i) Relief valves or rupture discs shall be installed as relief devices in the piping system if the maximum design pressure of the piping system can be exceeded. The relief device set pressure shall not exceed the maximum design pressure of the piping system. Relief devices shall discharge to a location in the weather at least 3 m (10 ft) from sources of ignition or openings to spaces or tanks.

(j) Outlet stations are to be provided with suitable protective devices which will prevent the back flow of gas into the supply lines and prevent the passage of flame into the supply lines.

(k) Shutoff valves shall be fitted at each outlet.

[CGD 95–028, 62 FR 51201, Sept. 30, 1997]

§56.50–105 Low-temperature piping.

(a) *Class I–L.* Piping systems designated to operate at temperatures below 0 °F. and pressures above 150 pounds per square inch gage shall be of Class I–L. Exceptions to this rule may be found in the individual requirements for specific commodities in subchapters D, I, and O of this chapter. The following requirements for Class I–L piping systems shall be satisfied:

(1) *Materials.* All materials used in low temperature piping systems shall be selected from among those specifications listed in Table 56.50–105 and shall satisfy all of the requirements of the specifications, except that:

(i) The minimum service temperature as defined in §54.25–10(a)(2) of this subchapter shall not be colder than that shown in Table 56.50–105; and

(ii) The material shall be tested for low temperature toughness using the Charpy V-notch specimen of ASTM E 23 (incorporated by reference, see §56.01–2), "Notched Bar Impact Testing of Metallic Materials", Type A, Figure 4. The toughness testing requirements of subpart 54.05 of this subchapter shall be satisfied for each particular product form. Charpy V-notch tests shall be conducted at temperatures not warmer than 10 °F. below the minimum service temperature of the design, except that for service temperatures of —320 °F. and below, the impact test may be conducted at the service temperature. The minimum average energy shall not be less than that shown in Table 56.50–105. In the case of steels conforming to the specifications of Table 54.25–20(a) of this subchapter the minimum lateral expansion shall not be less than that required in §54.25–20 of this subchapter. The minimum energy permitted for a single specimen and the minimum subsize energies shall be those obtained

by multiplying the average energy shown in Table 56.50–105 by the applicable fraction shown in Table 56.50–105(a).

TABLE 56.50–105(a)—CHARPY V-NOTCH ENERGY MULTIPLYING FACTORS

Charpy V-notch specimen size [1]	Factor for minimum energy, average of 3 specimens [1]	Factor for minimum energy single specimen [1]
10×10 mm	1	2/3
10×7.5 mm	5/6	5/9
10×5.0 mm	2/3	4/9
10×2.5 mm	1/2	1/3

[1] Straight line interpolation for intermediate values is permitted.

(iii) Steels equivalent to those listed in Table 56.50–105 of this part, but not produced according to a particular ASTM specification, may be used only with the prior consent of the Marine Safety Center. Steels differing in chemical composition, mechanical properties or heat treatments from those specified may be specially approved by the Marine Safety Center. Similarly, aluminum alloys and other nonferrous materials not covered in Table 56.50–105 of this part may be specifically approved by the Marine Safety Center for service at any low temperature. There are restrictions on the use of certain materials in this part and in subchapter O of this chapter.

(2) *Piping weldments.* Piping weldments shall be fabricated to satisfy the requirements of §57.03–1(b) of this subchapter in addition to subpart 56.70. Toughness testing of production weldments for low temperature piping systems and assemblies is not required.

(3) *Postweld heat treatment.* All piping weldments shall be postweld heat treated for stress relief in accordance with the procedures of subpart 56.85. The only exceptions to this requirement are for materials which do not require postweld heat treatment as shown in Table 56.85–10. Relief from postweld heat treatment shall not be dependent upon pipe thickness or weld joint type.

(4) *Nonacceptable joints.* Single welded butt joints with backing ring left in place, socket welds, slip-on flanges, pipe joining sleeves, and threaded joints shall not be used, except in small diameter instrument lines.

(5) *Other requirements.* All other requirements of this part for Class I piping apply to Class I–L piping. Pressure testing must comply with subpart 56.97 of this part, and nondestructive testing of circumferentially welded joints must comply with §56.95–10. Seamless tubular products must be used except that, when the service pressure does not exceed 1724 KPa (250 psi), the Commanding Officer, Marine Safety Center, may give special consideration to appropriate grades of piping and tubing that are welded without the addition of filler metal in the root pass. Each production procedure and quality-control program for welded products must be acceptable to the Officer in Charge, Marine Inspection.

(b) *Class II–L.* Piping systems designed to operate at temperatures below 0 °F. and pressures not higher than 150 pounds per square inch gage shall be of Class II–L. Exceptions to this rule may be found in the individual requirements for specific commodities in subchapter D (Tank Vessels) and I (Cargo and Miscellaneous Vessels) of this chapter. The following requirements for Class II–L piping systems shall be satisfied:

(1) Materials must be the same as those required by paragraph (a)(1) of this section except that pipe and tubing of appropriate grades welded without the addition of a filler metal may be used. The Commandant may give special consideration to tubular products welded with the addition of filler metal.

(2) Piping weldments shall be fabricated to satisfy the requirements of §57.03–1(b) of this subchapter in addition to subpart 56.70. Toughness testing of production weldments for low temperature piping systems and assemblies is not required.

(3) All piping weldments shall be postweld heat treated for stress relief in accordance with the procedures of subpart 56.85. The only exceptions to this requirement are for materials which do not require postweld heat treatment as shown in Table 56.85–10 and for socket weld joints and slip-on flange weld attachments where the weld thickness does not exceed that exempted by this table. Otherwise, relief from post-weld heat treatment shall

not be dependent upon pipe thickness or weld joint type.

(4) Socket welds in nominal sizes above 3 inches, slip-on flanges in nominal sizes above 4 inches, and threaded joints in sizes above 1 inch shall not be used.

(5) Pressure testing must comply with Subpart 56.97, and nondestructive testing of welded joints must comply with §56.95–10.

(6) All other requirements contained in this part for Class II piping shall be applicable to Class II–L systems, except that §56.70–15(b)(3)(iv) shall not apply.

TABLE 56.50–105—ACCEPTABLE MATERIALS AND TOUGHNESS TEST CRITERIA[2]

Product form	ASTM specification[3]	Grade[4]	Minimum service temperature	Minimum avg Charpy V notch energy
Pipe		1	−30 °F	20 ft. lb.
		3	−150 °F	25 ft. lb.
Tube (carbon and low alloy steels).	A–333 and A–334	4 (A–333 only)	−100 °F	25 ft. lb.
		6	−30 °F	20 ft. lb.
		7	−100 °F	25 ft. lb.
		8	−320 °F	Refer to §54.25–20 of this subchapter.
Pipe (Austenitic stainless steel).	A–312	All Grades	No limit	Austenitic stainless steel piping need be impact tested only when toughness tests are specified in subpart 54.25 of this subchapter for plating of the same alloy designation. When such toughness tests are required, the minimum average energy is 25 ft. lb.
Wrought welding fittings (carbon and low alloy steels).	A–420	WPL1	−30 °F	20 ft. lb.
		WPL3	−150 °F	25 ft. lb.
		WPL4	−100 °F	25 ft. lb.
Forged or rolled flanges, forged fittings, valves and pressure parts (carbon and low alloy steels).	A–350[1]	LF1	−30 °F	20 ft. lb.
		LF2	−30 °F	20 ft. lb.
		LF3	−150 °F	25 ft. lb.
		LF4	−100 °F	25 ft. lb.
Forged or rolled flanges, forged fittings, valves and pressure parts (high alloy steels).	A–182	Austenitic grades only (304, 304H, 304L, 310, 316, 316H, 316L, 321, 321H, 347, 347H, 348, 348H).	No limit	These products need be impact tested only when toughness tests are specified in subpart 54.25 of this subchapter for plating of the same alloy designation. When such toughness tests are required, the minimum average energy is 25 ft. lb.
Forged flanges, fittings, and valves (9% nickel).	A–522	9% Ni	−320 °F	Refer to §54.25–20 of this subchapter.
Castings for valves and pressure parts (carbon and low alloy steels).	A–352[1]	LCB	−30 °F	20 ft. lb.
		LC1	−50 °F	20 ft. lb.
		LC2	−100 °F	25 ft. lb.
		LC3	−150 °F	25 ft. lb.
Castings for valves and pressure parts (high alloy steel).	A–351	Austenitic grades CF3, CF3A, CF8, CF8A, CF3M, CF8M, CF8C, CK20 only.	No limit, except −325 °F for grades CF8C and CK20.	No toughness testing required except for service temperatures colder than −425 °F for grades CF3, CF3A, CF8, CF8A, CF3M, and CF8M. 25 ft. lb. average must be

TABLE 56.50–105—ACCEPTABLE MATERIALS AND TOUGHNESS TEST CRITERIA[2]—Continued

Product form	ASTM specification[3]	Grade[4]	Minimum service temperature	Minimum avg Charpy V notch energy
				attained in these tests.
Bolting	A–320	L7, L9, L10, L43	−150 °F	20 ft. lb.
		B8D, B8T, B8F, B8M	−325 °F	No test required.
		2B8, B8C	No limit	No test required, except for service temperatures colder than −425 °F. In such case the minimum average energy is 25 ft. lb.
		4	−150 °F	20 ft. lb.
Nuts, bolting	A–194	8T, 8F	−325 °F	No test required.
		8, 8C	No limit	Same requirement as comparable grades (B8, B8C) of bolting listed above.

[1] Quench and temper heat treatment may be permitted when specifically authorized by the Commandant. In those cases the minimum average Charpy V-notch energy shall be specially designated by the Commandant.

[2] Other material specifications for product forms acceptable under part 54 for use at low temperatures may also be used for piping systems provided the applicable toughness requirements of this Table are also met.

[3] Any repair method must be acceptable to the Commandant (G–MSE), and welding repairs as well as fabrication welding must be in accordance with part 57 of this chapter.

[4] The acceptability of several alloys for low temperature service is not intended to suggest acceptable resistance to marine corrosion. The selection of alloys for any particular shipboard location must take corrosion resistance into account and be approved by the Marine Safety Center.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 72–59R, 37 FR 6189, 6190, Mar. 25, 1972; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CG 79–108, 43 FR 46545, Oct. 10, 1978; CGD 74–289, 44 FR 26008, May 3, 1979; CGD 77–140, 54 FR 40611, Oct. 2, 1989; CGD 83–043, 60 FR 24775, May 10, 1995; USCG–2000–7790, 65 FR 58460, Sept. 29, 2000]

§ 56.50–110 Diving support systems.

(a) In addition to the requirements of this part, piping for diving installations which is permanently installed on the vessel must meet the requirements of subpart B (Commercial Diving Operations) of part 197 of this chapter.

(b) Piping for diving installations which is not permanently installed on the vessel need not meet the requirements of this part, but must meet the requirements of subpart B of part 197 of this chapter.

(c) Piping internal to a pressure vessel for human occupancy (PVHO) need not meet the requirements of this part, but must meet the requirements of subpart B of part 197 of this chapter.

[CGD 76–009, 43 FR 53683, Nov. 16, 1978]

Subpart 56.60—Materials

§ 56.60–1 Acceptable materials and specifications (replaces 123 and Table 126.1 in ANSI–B31.1).

(a)(1) The material requirements in this subpart shall be followed in lieu of those in 123 in ANSI–B31.1.

(2) Materials used in piping systems must be selected from the specifications which appear in Table 56.60–1(a) of this section or Table 56.60–2(a) of this part, or they may be selected from the material specifications of section I, III, or VIII of the ASME Code if not prohibited by a regulation of this subchapter dealing with the particular section of the ASME Code. Table 56.60–1(a) of this section contains only pipe, tubing, and fitting specifications. Determination of acceptability of plate, forgings, bolting, nuts, and castings may be made by reference to the ASME Code as previously described. Additionally, accepted materials for use as piping system components appear in Table 56.60–2(a) of this part. Materials conforming to specifications not described in this subparagraph must receive the

specific approval of the Marine Safety Center before being used. Materials listed in Table 126.1 of ANSI B31.1 are not accepted unless specifically permitted by this paragraph.

(b) Components made in accordance with the commercial standards listed in Table 56.60–1(b) of this section and made of materials complying with paragraph (a) this section may be used in piping systems within the limitations of the standards and within any further limitations specified in this subchapter.

TABLE 56.60–1(A)—ADOPTED SPECIFICATIONS AND STANDARDS

NOTE: Table 56.60–1(A) replaces Table 126.1 in ANSI B31.1 and sets forth specifications of pipes, tubing, and fittings intended for use in piping-systems. The first column lists acceptable standards from ASTM; the second lists those from ANSI. The Coast Guard will consider use of alternative pipes, tubing, and fittings when it receives certification of their mechanical properties. Without this certification it will restrict use of such alternatives to piping-systems inside heat exchangers that ensure containment of the material inside pressure shells.

Pipe, seamless:		
A106 Carbon steel	ANSI–B31.1	
A335 Ferritic alloys	ANSI–B31.1	
A376 Austenitic alloys	ANSI–B31.1	(1).
Pipe, seamless and welded:		
A53 Types S, F, and E steel pipe	ANSI–B31.1	(2 3 4).
A312 Austenitic steel (welded with no filler metal)	ANSI–B31.1	(1 4).
A333 Low temperature steel pipe	Sec. VIII, ASME Code	(5).
Pipe, welded:		
A134 Fusion welded steel plate pipe	See footnote 7	(7).
A135 ERW pipe	ANSI–B31.1	(3).
A139 Grade B only, fusion welded steel pipe	ANSI–B31.1	(8).
A358 Electric fusion welded pipe, high temperature, austenitic.	ANSI–B31.1	(1 4 9).
Pipe, forged and bored:		
A369 Ferritic alloy	ANSI–B31.1	
Pipe, centrifugally cast:	(None applicable)	(1 9)
Tube, seamless:		
A179 Carbon steel heat exchanger and condenser tubes.	UCS23, Sec. VIII, ASME Code	(11).
A192 Carbon steel boiler tubes	PG23.1, Sec. I, ASME Code	(10).
A210 Medium carbon boiler tubes	PG23.1, Sec. I, ASME Code	
A213 Ferritic and austenitic boiler tubes	PG23.1, Sec. I, ASME Code	(1).
Tube, seamless and welded:		
A268 Seamless and ERW ferritic stainless tubing	PG23.1, Sec. I, ASME Code	(4).
A334 Seamless and welded (no added filler metal) carbon and low alloy tubing for low temperature.	UCS23, Sec. VIII, ASME Code	(4 5).
Tube, welded:		
A178 (Grades A and C only) ERW boiler tubes	PG23.1, Sec. I, ASME Code	(10 Grade A) (4).
A214 ERW heat exchanger and condenser tubes	UCS27, Sec. VIII, ASME Code	
A226 ERW boiler and superheater tubes	PG23.1, Sec. I, ASME Code	(4 10).
A249 Welded austenitic boiler and heat exchanger tubes (no added filler metal).	PG23.1, Sec. I, ASME Code	(1 4).
Wrought fittings (factory made):		
A234 Carbon and ferritic alloys	Conforms to applicable American National Standards (ANSI–B16.9 and ANSI–B16.11).	(12).
A403 Austenitic alloys	.....do	(12).
A420 Low temperature carbon and steel alloy	.....do	(12).
Castings,13 iron:		
A47 Malleable iron	Conform to applicable American National Standards or refer to UCI–23 or UCD–23, Sec. VIII, ASME Code.	(14).
A126 Gray iron	.....do	(14).
A197 Malleable iron	.....do	(14).
A395 Ductile iron	UCD–23, Sec. VIII, ASME Code	(14).
A536 Ductile iron	See footnote 20	(20).

NONFERROUS MATERIALS 15

Pipe, seamless:		
B42 Copper	UNF23, Sec. VIII, ASME Code	(16).
B43 Red brass	.....do	
B241 Aluminum alloy	.....do	
Pipe and tube, seamless:		
B161 Nickel	.....do	
B165 Nickel-copper	.....do	
B167 Ni-Cr-Fe	.....do	
B315 Copper-silicon	.....do	

TABLE 56.60–1(A)—ADOPTED SPECIFICATIONS AND STANDARDS—Continued

NOTE: Table 56.60–1(A) replaces Table 126.1 in ANSI B31.1 and sets forth specifications of pipes, tubing, and fittings intended for use in piping-systems. The first column lists acceptable standards from ASTM; the second lists those from ANSI. The Coast Guard will consider use of alternative pipes, tubing, and fittings when it receives certification of their mechanical properties. Without this certification it will restrict use of such alternatives to piping-systems inside heat exchangers that ensure containment of the material inside pressure shells.

Tube, seamless:		
B68 Copper	See footnote 17	(16 17 18).
B75 Copper	UNF23, Sec. VIII, ASME Code	(16).
B88 Copper	See footnote 17	(16 17).
B111 Copper and copper alloy	UNF23, Sec. VIII, ASME Code	
B210 Aluminum alloy, drawn	.....do	
B234 Aluminum alloy, drawn	.....do	
B280 Copper tube for refrigeration service	See footnote 17	(16 17).
Welding fittings:		
B361 Wrought aluminum welding fittings	Shall meet ANSI Standards	

ASTM specification	Minimum tensile	Longitudinal joint efficiency	P No.	Allowable stresses (p.s.i.)
A134:				
Grade 285A	45,000	0.80	1	11,250×0,8=9,000.
Grade 285B	50,000	0.80	1	12,500×0,8=10,000.
Grade 285C	55,000	0.80	1	13,750×0,8=11,000.

NOTE: When using 104.1.2 in ANSI–B31.1 to compute wall thickness, the stress shown here shall be applied as though taken from the stress tables. An additional factor of 0.8 may be required by § 56.07–10(c) and (e).

[1] For austenitic materials where two sets of stresses appear, use the lower values.

[2] Type F (Furnace welded, using open hearth, basic oxygen, or electric furnace only) limited to Class II applications with a maximum service temperature of 450 °F. Type E (ERW grade) limited to maximum service temperature of 650 °F, or less.

[3] Electric resistance welded pipe or tubing of this specification may be used to a maximum design pressure of 350 pounds per square inch gage.

[4] Refer to limitations on use of welded grades given in § 56.60–2(b).

[5] Use generally considered for Classes I–L and II–L applications. For Class I–L service only, the seamless grade is permitted. For other service refer to footnote 4 and to § 56.50–105.

[6] Furnace lap or furnace butt grades only. Limited to Class II applications only where the maximum service temperature is 450 °F, or less.

[7] Limited to Grades 285A, 285B, and 285C only (straight and spiral seam). Limited to Class II applications only where maximum service temperature is 300 °F or less for straight seam, and 200 °F or less for spiral seam.

[8] Limited to Class II applications where the maximum service temperature is 300 °F or less for straight seam and 200 °F or less for spiral seam.

[9] For Class I applications only the Class I Grade of the specification may be used.

[10] When used in piping systems, a certificate shall be furnished by the manufacturer certifying that the mechanical properties at room temperature specified in ASTM A520 have been met. Without this certification, use is limited to applications within heat exchangers.

[11] When used in piping systems, a certificate shall be furnished by the manufacturer certifying that the mechanical properties for A192 in ASTM A520 have been met. Without this certification, use is limited to applications within heat exchangers.

[12] Hydrostatic testing of these fittings is not required but all fittings shall be capable of withstanding without failure, leakage, or impairment of serviceability, a hydrostatic test of 1½ times the designated rating pressure.

[13] Other acceptable iron castings are in UCI–23 and UCD–23 of section VIII of the ASME Code. (See also §§ 56.60–10 and 56.60–15.) Acceptable castings of materials other than cast iron may be found in section I or VIII of the ASME Code.

[14] Acceptable when complying with American National Standards. Ductile iron is acceptable for temperatures not exceeding 650 °F. For pressure temperature limitations refer to UCD–3 of section VIII of the ASME Code. Other grades of cast iron are acceptable for temperatures not exceeding 450 °F. For pressure temperature limitations refer to UCI–3 of section VIII of the ASME Code.

[15] For limitations in use refer to §§ 56.10–5(c) and 56.60–20.

[16] Copper pipe must not be used for hot oil systems except for short flexible connections at burners. Copper pipe must be annealed before installation in Class I piping systems. See also §§ 56.10–5(c) and 56.60–20.

[17] The stress values shall be taken from UNF23 of section VIII of the ASME Code for B75 annealed and light drawn temper as appropriate.

[18] B68 shall be acceptable if provided with a mill hydrostatic or eddy current test.

[19] Centrifugally cast pipe must be specifically approved by the Marine Safety Center.

[20] Limited to pipe fittings and valves. See § 56.60–15(d) for additional information.

TABLE 56.60–1(B)—ADOPTED STANDARDS APPLICABLE TO PIPING SYSTEMS (REPLACES TABLE 126.1)

ANSI Standards (American National Standards Institute), 11 West 42nd Street, New York, NY 10036.

B1.1	Unified Screw Threads.
B1.20.1 ..	Pipe Threads, General Purpose.
B1.20.3 ..	Dryseal Pipe Threads.
B2.1	Pipe Threads.
B2.2	[Reserved]
B16.1	C.I. Flanges and Fittings—Classes 125 and 250 Only.

TABLE 56.60–1(B)—ADOPTED STANDARDS APPLICABLE TO PIPING SYSTEMS (REPLACES TABLE 126.1)—Continued

B16.3	M.I. Threaded Fittings—Classes 150 and 300.
B16.4	C.I. Threaded Fittings—Classes 125 and 250.
B16.5	Steel Pipe Flanges and Flanged Fittings.[3]
B16.9	Steel Buttwelding Fittings.[3]
B16.10 ...	Dimensions of Ferrous Valves.
B16.11 ...	Steel S.W. and Threaded Fittings.
B16.14 ...	Ferrous-Threaded Plugs, Bushings and Locknuts.[4]
B16.15 ...	Cast Bronze Threaded Fittings—Classes 125 & 250.[4]

TABLE 56.60–1(B)—ADOPTED STANDARDS APPLICABLE TO PIPING SYSTEMS (REPLACES TABLE 126.1)—Continued

B16.18 ...	Cast Copper Alloy Solder Joints.[4]
B16.20 ...	Ring Joint Gaskets—Steel Flanges.
B16.21 ...	Non-metallic Gaskets for Flanges.
B16.22 ...	Wrought Copper and Copper Alloy Solder Joint Fittings.[4]
B16.23 ...	Cast Copper Alloy Solder-Joint Drainage Fittings.[4]
B16.24 ...	Bronze Pipe Flanges and Flanged Fittings—Class 150 and 300.[3]
B16.25 ...	Butt Welding Ends—Pipe, Valves, Flanges, & Fittings.
B16.28 ...	Wrought Steel Buttwelding Short Radius Elbows and Returns.[4]
B16.29 ...	Wrought Copper and Wrought-Copper Alloy Solder Joint Drainage Fittings.[4]
B16.34 ...	Valves—Flanged, Threaded and Welding end.[3]
B16.42 ...	Ductile Iron Pipe Flanges and Fittings.[3]
B18.2	[Reserved]
B18.2.1 ..	Square and Hex Bolts and Screws, Inch series.
B18.2.2 ..	Square and Hex Nuts.
ASTM Standards (American Society for Testing and Materials), 100 Barr Harbor Drive, Conshohocken, PA 19428—2959.	
F682	Wrought Carbon Steel Sleeve-Type Couplings.
F1006	Entrainment Separators for Use in Marine Piping Applications.[4]
F1007	Pipe Line Expansion Joints of the Packed Slip Type for Marine Applications.
F1020	Line Blind Valves for Marine Applications.[4]
F1120	Circular Metallic Bellows Type Expansion Joints.
F1123	Non-Metallic Expansion Joints.
F1139	Steam Traps and Drains.
F1172	Fuel Oil Meters of the Volumetric Positive Displacement Type.
F1173	Epoxy Resin Fiberglass Pipe and Fittings to be Used for Marine Applications.
F1199	Cast and Welded Pipe Line Strainers.
F1200	Fabricated (Welded) Pipe Line Strainers.
F1201	Fluid Conditioner Fittings in Piping Applications Above 0 °F.
EJMA Standards (Expansion Joint Manufacturers Association, Inc.), 25 North Broadway, Tarrytown, NY 10591	
Standards of the Expansion Joint Manufacturers Association, Inc.	
FCI Standards (Fluid Controls Institute, Inc.), 31 South Street, Suite 303, Morristown, NJ 07960.	
FCI 69–1	Pressure Rating Standard for Steam Traps.[4]
MSS Standards (Manufacturers' Standardization Society of the Valve and Fittings Industry), 127 Park Street NE, Vienna, VA 22180.	
B36.10 ...	Wrought-Steel & Iron Pipe.
B36.19 ...	Stainless Steel Pipe.
MSS Standards (Manufacturers' Standardization Society of the Valve and Fittings Industry), 1815 North Fort Myer Drive, Arlington, Va. 22209.	
SP–6	Finishes-On Flanges, Valves & Fittings.
SP–9	Spot-Facing.
SP–25	Standard Marking System for Valves, Fittings, Flanges and Unions.
SP–37	[Reserved]
SP–42	[Reserved]
SP–44	Steel Pipe Line Flanges.[4]

TABLE 56.60–1(B)—ADOPTED STANDARDS APPLICABLE TO PIPING SYSTEMS (REPLACES TABLE 126.1)—Continued

SP–45	Bypass and Drain Connection.
SP–51	Class 150LW Corrosion Resistant Cast Flanges and Flanged Fittings.[4]
SP–53	Magnetic Particle Inspection—Steel Castings.
SP–55	Visual Inspection—Steel Castings.
SP–58	Pipe Hangers & Supports.
SP–61	Hydrostatic Testing Steel Valves.
SP–66	[Reserved]
SP–67	Butterfly Valves.[2] [4]
SP–69	Pipe Hangers and Supports—Selection and Application.
SP–72	Ball Valves with Flanged or Butt-Welding Ends for General Service.[4]
SP–73	Silver Brazing Joints for Wrought and Cast Solder Joint Fittings.
SP–83	Carbon Steel Pipe Unions Socket-Welding and Threaded.

[1] [Reserved]

[2] In addition, for bronze valves, adequacy of body shell thickness shall be satisfactory to the Marine Safety Center. Refer to § 56.60–10 of this part for cast iron valves.

[3] Mill or manufacturer's certification is not required, except where a needed portion of the required marking is deleted due to size or is absent due to age of existing stocks.

[4] Because this standard offers the option of several materials, some of which are not generally acceptable to the Coast Guard, compliance with the standard does not necessarily indicate compliance with these regulations. The marking on the component or the manufacturer or mill certificate must indicate the material specification and/or grade as necessary to fully identify the materials used. The material used must comply with the requirements in this subchapter relating to the particular application.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGFR 72–59R, 37 FR 6190, Mar. 25, 1972; CGD 72–206R, 38 FR 17229, June 29, 1973; CGD 73–248, 39 FR 30839, Aug. 26, 1974; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CGD 77–140, 54 FR 40611, Oct. 2, 1989; 55 FR 39968, 39969, Oct. 1, 1990; CGD 95–027, 61 FR 26001, May 23, 1996; USCG–1999–6216, 64 FR 53224, Oct. 1, 1999; USCG–1999–5151, 64 FR 67180, Dec. 1, 1999]

§ 56.60–2 Limitations on materials.

Welded pipe and tubing. The following restrictions apply to the use of welded pipe and tubing specifications when utilized in piping systems, and not when utilized in heat exchanger, boiler, pressure vessel, or similar components:

(a) *Longitudinal joint.* Wherever possible, the longitudinal joint of a welded pipe shall not be pierced with holes for branch connections or other purposes.

(b) *Class II.* Use unlimited except as restricted by maximum temperature or pressure specified in Table 56.60–1(a) or by the requirements contained in § 56.10–5(b) of this chapter.

(c) *Class I.* (1) For those specifications in which a filler metal is used, the following applies to the material as furnished prior to any fabrication:

(i) For use in service above 800 °F. full welding procedure qualifications by the Coast Guard are required. See part 57 of this subchapter.

(ii) Ultrasonic examination as required by item S–6 in ASTM A–376 shall be certified as having been met in all applications except where 100 percent radiography is a requirement of the particular material specification.

(2) For those specifications in which no filler material is used in the welding process, the ultrasonic examination as required by item S–6 in ASTM A–376 shall be certified as having been met for service above 800 °F.

TABLE 56.60–2(A)—ADOPTED SPECIFICATIONS NOT LISTED IN THE ASME CODE

ASTM specifications	Source of allowable stress	Notes
FERROUS MATERIALS [1]		
Bar stock:		
A276 (Grades 304–A, 304L–A, 310–A, 316–A, 316L–A, 321–A, 347–A, and 348–A).	See footnote 4.	(4).
A575 and A576 (Grades 1010–1030)	See footnote 2	(2 3).
NONFERROUS MATERIALS		
Bar stock:		
B16 (soft and half hard tempers).	See footnote 5	(5 7).
B21 (alloys A, B, and C).	See footnote 8	(8).
B124:		
Alloy 377	See footnotes 5 and 9.	(5 9).
Alloy 464	See footnote 8	(8 10).
Alloy 655	See footnote 11	(11).
Alloy 642	See footnote 12	(7 12).
Alloy 630	See footnote 13	(7 13).
Alloy 485	See footnote 8	(8 10).
Forgings:		
B283 (forging brass)	See footnotes 5 and 9.	(5 9).
Castings:		
B26	See footnotes 5, 14, and 15.	(5 14 15).
B85	See footnotes 5, 14, and 15.	(5 14 15).

[1] For limitations in use refer to § 56.60–5.

[2] Allowable stresses shall be the same as those listed in UCS23 of section VIII of the ASME Code for SA–675 material of equivalent tensile strength.

[3] Physical testing shall be performed as for material manufactured to ASME Specification SA–675, except that the bend test shall not be required.

[4] Allowable stresses shall be the same as those listed in UCS23 of section VIII of the ASME Code for the corresponding SA–182 material.

[5] Limited to air and hydraulic service with a maximum design temperature of 150 °F. The material must not be used for salt water service or other fluids that may cause dezincification or stress corrosion cracking.

[6] [Reserved]

[7] An ammonia vapor test, in accordance with ASTM B 858M (incorporated by reference, see § 56.01–2), shall be performed on a representative model of each finished product design.

[8] Allowable stresses shall be the same as those listed in UNF23 of section VIII of the ASME Code for SB–171, naval brass.

[9] An ammonia vapor test, in accordance with ASTM B 858 (incorporated by reference, see § 56.01–2), shall be performed on a representative model for each finished product design. Tension tests shall be performed to determine tensile strength, yield strength, and elongation. Minimum values shall be those listed in table 3 of ASTM B283.

[10] Physical testing, including mercurous nitrate test, shall be performed as for material manufactured to ASTM B21.

[11] Physical testing shall be performed as for material manufactured to ASTM B96. Allowable stresses shall be the same as those listed in UNF23 of section VIII of the ASME Code for SB–96 and shall be limited to a maximum allowable temperature of 212 °F.

[12] Physical testing shall be performed as for material manufactured to ASTM B171, alloy D. Allowable stresses shall be the same as those listed in UNF23 of section VIII of the ASME Code for SB–171, aluminum bronze D.

[13] Physical testing shall be performed as for material manufactured to ASTM B171, alloy E. Allowable stresses shall be the same as those listed in UNF23 of section VIII of the ASME Code for SB–171, aluminum bronze, alloy E.

[14] Tension tests shall be performed to determine tensile strength, yield strength, and elongation. Minimum values shall be those listed in table X–2 of ASTM B85.

[15] Those alloys with a maximum copper content of 0.6 percent or less shall be acceptable under this specification. Cast aluminum shall not be welded or brazed.

Note: This Table 56.60–2(a) is a listing of adopted bar stock and nonferrous forging and casting specifications not listed in the ASME Code. Particular attention should be given to the supplementary testing requirements and service limitations contained in the footnotes.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 72–104R, 37 FR 14233, July 18, 1972; CGD 73–248, 39 FR 30839, Aug. 26, 1974; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CGD 77–140, 54 FR 40612, Oct. 2, 1989; CGD 95–012, 60 FR 48050, Sept. 18, 1995; CGD 95–027, 61 FR 26001, May 23, 1996; CGD 95–028, 62 FR 51201, Sept. 30, 1997; USCG–1998–4442, 63 FR 52190, Sept. 30, 1998; USCG–1999–5151, 64 FR 67180, Dec. 1, 1999]

§ 56.60–3 Ferrous materials.

(a) Ferrous pipe used for salt water service must be protected against corrosion by hotdip galvanizing or by the use of extra heavy schedule material.

(b) (Reproduces 123.2.3(c)). Carbon or alloy steel having a carbon content of more than 0.35 percent may not be used in welded construction or be shaped by oxygen cutting process or other thermal cutting process.

[CGD 73–254, 40 FR 40165, Sept. 2, 1975]

§ 56.60–5 Steel (High temperature applications).

(a) (Reproduces 123.2.3(a).) Upon prolonged exposure to temperatures above 775 °F., the carbide phase of plain carbon steel, plain nickel alloy steel, carbon-manganese alloy steel, manganese-

vanadium alloy steel, and carbon-silicon steel may be converted to graphite.

(b) (Reproduces 123.2.3(b).) Upon prolonged exposure to temperatures above 875 °F., the carbide phase of alloy steels, such as carbon-molybdenum, manganese-molybdenum-vanadium, manganese-chromium-vanadium and chromium-vanadium, may be converted to graphite.

(c) [Reserved]

(d) The design temperature of a piping system employing one or more of the materials listed in paragraphs (a), (b), and (c) of this section shall not exceed the lowest graphitization temperature specified for materials used.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 72–104R, 37 FR 14233, July 18, 1972; CGD 73–248, 39 FR 30839, Aug. 26, 1974; CGD 73–254, 40 FR 40165, Sept. 2, 1975]

§56.60–10 Cast iron and malleable iron.

(a) The low ductility of cast iron and malleable iron should be recognized and the use of these metals where shock loading may occur should be avoided. Cast iron and malleable iron components shall not be used at temperatures above 450 °F. Cast iron and malleable iron fittings conforming to the specifications of Table 56.60–1(a) of this part may be used at pressures not exceeding the limits of the applicable standards of Table 56.60–1(b) of this part at temperatures not exceeding 450 °F. Valves of either of these materials may be used if they conform to the standards for class 125 and class 250 flanges and flanged fittings in ANSI B16.1 and if their service does not exceed the rating as marked on the valve.

(b) Cast iron and malleable iron shall not be used for valves or fittings in lines carrying flammable or combustible fluids[1] which are directly connected to, or in the proximity of, equipment or other lines having open flame, or any parts operating at temperatures above 500 °F. Cast iron shall not be used for hull fittings, or in systems conducting lethal products.

(c) Malleable iron and cast iron valves and fittings, designed and marked for Class 300 refrigeration service, may be used for such service provided the pressure limitation of 300 pounds per square inch is not exceeded. Malleable iron flanges of this class may also be used in sizes 4 inches and smaller (oval and square design).

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CGD 77–140, 54 FR 40612, Oct. 2, 1989; CGD 95–027, 61 FR 26001, May 23, 1996]

§56.60–15 Ductile iron.

(a) Ductile cast iron components made of material conforming to ASTM A 395 (incorporated by reference, see §56.01–2) may be used within the service restrictions and pressure-temperature limitations of UCD–3 of section VIII of the ASME Code.

(b) Ductile iron castings conforming to ASTM A 395 (incorporated by reference, see §56.01–2) may be used in hydraulic systems at pressures in excess of 7500 kilopascals (1000 pounds per square inch) gage, provided the following:

(1) The castings receive a ferritizing anneal when the as-cast thickness does not exceed one inch;

(2) Large castings for components, such as hydraulic cylinders, are examined as specified for a casting quality factor of 90 percent in accordance with UG–24 of section VIII of the ASME Code; and

(3) The castings are not welded, brazed, plugged, or otherwise repaired.

(c) After machining, ductile iron castings must be hydrostatically tested to twice their maximum allowable working pressure and must show no leaks.

(d) Ductile iron castings exhibiting less than 12 percent elongation in 50 millimeters (2 inches) when subjected to a tensile test must meet the requirements for cast iron in this part.

[CGD 77–140, 54 FR 40612, Oct. 2, 1989, as amended by CGD 95–027, 61 FR 26001, May 23, 1996; USCG–2000–7790, 65 FR 58460, Sept. 29, 2000]

§56.60–20 Nonferrous materials.

Nonferrous materials listed in this subpart may be used in piping systems

[1] For definitions of flammable or combustible fluids, see §§30.10–15 and 30.10–22 of subchapter D (Tank Vessels) of this chapter.

under the following conditions (see also § 56.10–5(c)):

(a) The low melting points of many nonferrous metals and alloys, such as aluminum and aluminum alloys, must be recognized. These types of heat sensitive materials must not be used to conduct flammable, combustible, or dangerous fluids, or for vital systems unless approved by the Marine Safety Center.

NOTE: For definitions of flammable or combustible fluids, see §§ 30.10–15 and 30.10–22 or parts 151–154 of this chapter. Dangerous fluids are those covered by regulations in part 98 of this chapter.

(b) The possibility of galvanic corrosion due to the relative solution potentials of copper and aluminum and their alloys should be considered when used in conjunction with each other or with steel or with other metals and their alloys when an electrolyte is present.

(c) A suitable thread compound must be used in making up threaded joints in aluminum pipe to prevent seizing which might cause leakage and perhaps prevent disassembly. Pipe in the annealed temper should not be threaded.

(d) The corrosion resistance of copper bearing aluminum alloys in a marine atmosphere is poor and alloys with copper contents exceeding 0.6 percent should not be used. Refer to Table 56.60–2(a) of this part for further guidance.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 77–140, 54 FR 40612, Oct. 2, 1989; CGD 95–027, 61 FR 26001, May 23, 1996]

§ 56.60–25 Nonmetallic materials.

(a) Plastic pipe installations shall be in accordance with the International Maritime Organization (IMO) resolution A.753(18), Guidelines for the Application of Plastic Pipes on Ships and the following supplemental requirements:

(1) Materials used in the fabrication of plastic pipe shall comply with the appropriate standards listed in § 56.01–2 of this chapter.

(2) Plastic pipe is not permitted in a concealed space in an accommodation or service area, such as behind ceilings or linings or between double bulkheads, unless—

(i) Each trunk or duct containing such piping is completely surrounded by "A" class divisions; or

(ii) An approved smoke-detection system is fitted in the concealed space and each penetration of a bulkhead or deck and each installation of a draft stop is made in accordance with IMO resolution A.753(18) to maintain the integrity of fire divisions.

(3) Plastic pipe used outboard of the required metallic shell valve in any piping system penetrating the vessel's shell (see § 56.50–95(f)) shall have the same fire endurance as the metallic shell valve. Where the shell valve and the plastic pipe are in the same unmanned space, the valve shall be operable from above the freeboard deck.

(4) Pipe that is to be used for potable water shall bear the seal of approval or NSF mark of the National Sanitation Foundation Testing Laboratory, Incorporated, School of Public Health, University of Michigan, Ann Arbor, MI 48103.

(b) *Nonmetallic flexible hose.* (1) Nonmetallic flexible hose must be in accordance with SAE J–1942 and may be installed only in vital and nonvital fresh and salt water systems, nonvital pneumatic systems, lube oil and fuel systems, and fluid power systems.

(2) Nonmetallic flexible hose may be used in vital fresh and salt water systems at a maximum service pressure of 150 psi. Nonmetallic flexible hose may be used in lengths not exceeding 30 inches where flexibility is required subject to the limitations of paragraphs (a) (1) through (4) of this section. Nonmetallic flexible hose may be used for plastic pipe in duplicate installations in accordance with paragraph (a) of this section.

(3) Nonmetallic flexible hose may be used for plastic pipe in nonvital fresh and salt water systems and nonvital pneumatic systems subject to the limitations of paragraphs (a) (1) through (4) of this section. Unreinforced hoses are limited to a maximum service pressure of 50 psi, reinforced hoses are limited to a maximum service pressure of 150 psi.

(4) Nonmetallic flexible hose may be used in lube oil, fuel oil and fluid power

systems only where flexibility is required and in lengths not exceeding 30 inches.

(5) Nonmetallic flexible hose must be complete with factory-assembled end fittings requiring no further adjustment of the fittings on the hose, except that field attachable type fittings may be used. Hose end fittings must comply with SAE J–1475. Field attachable fittings must be installed following the manufacturer's recommended practice. If special equipment is required, such as crimping machines, it must be of the type and design specified by the manufacturer. A hydrostatic test of each hose assembly must be conducted in accordance with § 56.97–5 of this part.

(c) Plastic valves, fittings, and flanges may be used in systems employing plastic pipe. Such valves, fittings, and flanges shall be designed, fabricated, tested, and installed so as to satisfy the intent of the requirements for plastic pipe contained in this section.

(d) If it is desired to use nonmetallic materials other than those specified in this section, a request furnishing the chemical and physical properties of the material shall be submitted to the Commandant for consideration.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970; CGD 72–104R, 37 FR 14234, July 18, 1972; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CGD 77–140, 54 FR 40613, Oct. 2, 1989; CGD 88–032, 56 FR 35822, July 29, 1991; CGD 83–043, 60 FR 24775, May 10, 1995; CGD 95–072, 60 FR 50462, Sept. 29, 1995; CGD 96–041, 61 FR 50728, Sept. 27, 1996; CGD 95–028, 62 FR 51201, Sept. 30, 1997; USCG–2002–13058, 67 FR 61278, Sept. 30, 2002]

Subpart 56.65—Fabrication, Assembly and Erection

§ 56.65–1 General (replaces 127 through 135.4).

(a) The requirements for fabrication, assembly and erection in subparts 56.70 through 56.90 shall apply in lieu of 127 through 135.4 of ANSI–B31.1. Those paragraphs reproduced are so noted.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970]

Subpart 56.70—Welding

§ 56.70–1 General.

(a) The following generally applies to all types of welding, such as stud welding, casting repair welding and all processes of fabrication welding. Where the detailed requirements are not appropriate to a particular process, alternatives must be approved by the Marine Safety Center.

[CGD 77–140, 54 FR 40614, Oct. 2, 1989]

§ 56.70–3 Limitations.

Backing rings. Backing strips used at longitudinal welded joints must be removed.

[CGD 73–254, 40 FR 40165, Sept. 2, 1975]

§ 56.70–5 Material.

(a) *Filler metal.* All filler metal, including consumable insert material, must comply with the requirements of section IX, ASME Boiler and Pressure Vessel Code and § 57.02–5 of this subchapter.

(b) *Backing rings.* When metallic backing rings are used they shall be made from material of weldable quality compatible with the base metal, whether subsequently removed or not. When nonmetallic backing rings are used they shall be of material which does not deleteriously affect either base or weld metal, and shall be removed after welding is completed. Backing rings may be of the consumable insert type, removable ceramic type, of solid or split band type. A ferrous backing ring which becomes a permanent part of the weld shall not exceed 0.05 percent sulphur. If two abutting surfaces are to be welded to a third member used as a backing ring and one or two of the three members are ferritic and the other member or members are austenitic, the satisfactory use of such materials shall be determined by procedure qualifications.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 73–254, 40 FR 40165, Sept. 2, 1975; USCG–2002–13058, 67 FR 61278, Sept. 30, 2002]

§ 56.70–10 Preparation (modifies 127.3).

(a) *Butt welds (reproduces 127.3.1*)—(1) *End preparation*. (i) Oxygen or arc cutting is acceptable only if the cut is reasonably smooth and true, and all slag is cleaned from the flame cut surfaces. Discoloration which may remain on the flame cut surface is not considered to be detrimental oxidation.

(ii) Butt-welding end preparation dimensions contained in ANSI–B16.25 or any other end preparation which meets the procedure qualification requirements are acceptable.

(iii) If piping component ends are bored, such boring shall not result in the finished wall thickness after welding being less than the minimum design thickness. Where necessary, weld metal of the appropriate analysis may be deposited on the inside or outside of the piping component to provide sufficient material for machining to insure satisfactory fitting of rings.

(iv) If the piping component ends are upset they may be bored to allow for a completely recessed backing ring, provided the remaining net thickness of the finished ends is not less than the minimum design thickness.

(2) *Cleaning.* Surfaces for welding shall be clean and shall be free from paint, oil, rust, scale, or other material which is detrimental to welding.

(3) *Alignment.* The inside diameters of piping components to be joined must be aligned as accurately as practicable within existing commercial tolerances on diameters, wall thicknesses, and out of roundness. Alignment must be preserved during welding. Where ends are to be joined and the internal misalignment exceeds 1/16-inch, it is preferred that the component with the wall extending internally be internally trimmed (see Fig. 127.3.1) so that adjoining internal surfaces are approximately flush. However, this trimming must not reduce a piping component wall thickness below the minimum design thickness and the change in the contour may not exceed 30°.

(4) *Spacing.* The root opening of the joint shall be as given in the procedure specification.

(b) *Fillet welds (modifies 127.3.2).* In making fillet welds, the weld metal must be deposited in such a way as to obtain adequate penetration into the base metal at the root of the weld. Piping components which are to be joined utilizing fillet welds must be prepared in accordance with applicable provisions and requirements of this section. For typical details, see Figures 127.4.4A and 127.4.4C of ANSI B31.1 and Figure 56.30–10(b) of this part. See § 56.30–5(d) of this part for additional requirements.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CGD 77–140, 54 FR 40614, Oct. 2, 1989]

§ 56.70–15 Procedure.

(a) *General.* (1) Qualification of the welding procedures to be used, and of the performance of welders and operators, is required, and shall comply with the requirements of part 57 of this subchapter.

(2) No welding shall be done if there is direct impingement of rain, snow, sleet, or high wind on the piping component weldment.

(3) Sections of pipe shall be welded insofar as possible in the fabricating shop. Prior to welding Class I piping or low temperature piping, the fabricator shall request a marine inspector to visit his plant to examine his fabricating equipment and to witness the qualification tests required by part 57 of this subchapter. One test specimen shall be prepared for each process and welding position to be employed in the fabrication.

(b) *Girth butt welds.* (1) (Reproduces 127.4.2(a)). Girth butt welds must be complete penetration welds and may be made with a single vee, double vee, or other suitable type of groove, with or without backing rings or consumable inserts."

(2) Girth butt welds in Class I, I–L, and II–L piping systems shall be double welded butt joints or equivalent single welded butt joints for pipe diameters exceeding three-fourth inch nominal pipe size. The use of a single welded butt joint employing a backing ring (note restrictions in paragraph (b)(3)(iv) of this section) on the inside of the pipe is an acceptable equivalent for Class I and Class II–L applications, but not permitted for Class I–L applications. Single welded butt joints employing either an inert gas for first

pass backup or a consumable insert ring may be considered the equivalent of a double welded butt joint for all classes of piping and is preferable for Class I–L and II–L systems where double butt welds cannot be used. Appropriate welding procedure qualification tests shall be conducted as specified in part 57 of this subchapter. A first pass inert gas backup is intended to mean that the inside of the pipe is purged with inert gas and that the root is welded with the inert gas metal arc (mig) or inert gas tungsten arc (tig) processes. Classes I, I–L, and II–L piping are required to have the inside of the pipe machined for good fit up if the misalignment exceeds that specified in §56.70–10(a)(3). In the case of Class II piping the machining of the inside of the pipe may be omitted. For single welded joints, where possible, the inside of the joint shall be examined visually to assure full penetration. Radiographic examination of at least 20 percent of single welded joints to check for penetration is required for all Class I and Class I–L systems regardless of size following the requirements of §56.95–10. Ultrasonic testing may be utilized in lieu of radiographic examination if the procedures are approved.

(3) For Class II piping, the type of joints shall be similar to Class I piping, with the following exceptions:

(i) Single-welded butt joints may be employed without the use of backing rings in all sizes provided that the weld is chipped or ground flush on the root side of the weld.

(ii) For services such as vents, overflows, and gravity drains, the backing ring may be eliminated and the root of the weld need not be ground.

(iii) Square-groove welds without edge preparation may be employed for butt joints in vents, overflows, and gravity drains where the pipe wall thickness does not exceed three-sixteenth inch.

(iv) The crimped or forged backing ring with continuous projection around the outside of the ring is acceptable only for Class II piping. The projection must be completely fused.

(4) Tack welds which become part of the finished weld, shall be made by a qualified welder. Tack welds made by an unqualified welder shall be removed. Tack welds which are not removed shall be made with an electrode which is the same as or equivalent to the electrode to be used for the first pass. Their stopping and starting ends must be properly prepared by grinding or other suitable means so that they may be satisfactorily incorporated into the final weld. Tack welds which have cracked shall be removed.

(5) (Reproduces 127.2(c)). When components of different outside diameters are welded together, the weld joint must be filled to the outside surface of the component having the larger diameter. There must be a gradual transition, not exceeding a slope of 1:3, in the weld between the two surfaces. To avoid unnecessary weld deposit, the outside surface of the component having the larger diameter must be tapered at an angle not to exceed thirty degrees with the axis of the pipe. (See Fig. 127.4.2.)

(6) (Modifies 127.4.2(d)). As-welded surfaces are permitted, however, the surface of welds must be sufficiently free from coarse ripple, grooves, overlaps, abrupt ridges and valleys to meet the following:

(i) The surface condition of the finished welds must be suitable for the proper interpretation of radiographic and other nondestructive examinations when nondestructive examinations are required by §56.95–10. In those cases where there is a question regarding the surface condition on the interpretation of a radiographic film, the film must be compared to the actual weld surface for interpretation and determination of acceptability.

(ii) Reinforcements are permitted in accordance with Table 56.70–15.

(iii) Undercuts must not exceed 1/32-inch and must not encroach on the minimum required section thickness.

(iv) If the surface of the weld requires grinding to meet the above criteria, care must be taken to avoid reducing the weld or base material below the minimum required thickness.

(7) The type and extent of examination required for girth butt welds is specified in §56.95–10.

(8) Sections of welds that are shown by radiography or other examination

to have any of the following type of imperfections shall be judged unacceptable and shall be repaired as provided in paragraph (f) of this section:

(i) Any type of crack or zone of incomplete fusion or penetration.

(ii) Any slag inclusion or porosity greater in extent than those specified as acceptable set forth in PW–51 of section I of the ASME Code.

(iii) Undercuts in the external surfaces of butt welds which are more than 1/32-inch deep.

(iv) Concavity on the root side of full penetration girth butt welds where the resulting weld thickness is less than the minimum pipe wall thickness required by this subchapter. Weld reinforcement up to a maximum of 1/32-inch thickness may be considered as pipe wall thickness in such cases.

(c) *Longitudinal butt welds.* Longitudinal butt welds in piping components not made in accordance with the standards and specifications listed in 56.60–1 (a) and (b) must meet the requirements of paragraph 104.7 of ANSI–B31.1 and may be examined nondestructively by an acceptable method. Imperfections shall not exceed the limits established for girth butt welds except that no undercutting shall be permitted in longitudinal butt welds. See also § 56.60–2(b).

(d) *Fillet welds.* (1) Fillet welds may vary from convex to concave. The size of a fillet weld is determined as shown in Figure 127.4.4A in ANSI B31.1. Fillet weld details for socket-welding components must meet § 56.30–5(c) of this part. Fillet weld details for flanges must meet § 56.30–10(c) of this part. Fillet weld details for flanges must meet § 56.30–10 of this part.

(2) The limitations on cracks and undercutting set forth in paragraph (b)(8) of this section for girth welds are also applicable to fillet welds.

(3) Class I piping not exceeding 3 inches nominal pipe size and not subject to full radiography by § 56.95–10 of this part may be joined by sleeves fitted over pipe ends or by socket type joints. Where full radiography is required, only butt type joints may be used. The inside diameter of the sleeve must not exceed the outside diameter of the pipe or tube by more than 0.080 inch. Fit between socket and pipe must conform to applicable standards for socket weld fittings. Depth of insertion of pipe or tube within the socket or sleeve must not be less than three-eighths inch. The fillet weld must be deposited in a minimum of two passes, unless specifically approved otherwise in a special procedure qualification. Requirements for joints employing socket weld and slip-on flanges are in § 56.30–10 of this part.

(4) Sleeve and socket type joints may be used in Class II piping systems without restriction as to size of pipe or tubing joined. Applicable standards must be followed on fit. The fillet welds must be deposited in a minimum of two passes, unless specifically approved otherwise in a special procedure qualification. Requirements for joints employing socket weld and slip-on flanges are in § 56.30–10 of this part.

(e) *Seal welds (reproduces 127.4.5).* (1) Where seal welding of threaded joints is performed, threads shall be entirely covered by the seal weld. Seal welding shall be done by qualified welders.

(2) The limitation on cracks and undercutting set forth in § 56.70–15(b)(8) for girth welds are also applicable to seal welds.

(f) *Weld defect repairs (reproduces 127.4.11).* (1) All defects in welds requiring repair must be removed by a flame or arc-gouging, grinding, chipping, or machining. Repair welds must be made in accordance with the same procedures used for original welds, or by another welding process if it is a part of a qualified procedure, recognizing that the cavity to be repaired may differ in contour and dimensions from the original joint. The types, extent, and method of examination and limits of imperfections of repair welds shall be the same as for the original weld.

(2) Preheating may be required for flame-gouging or arc-gouging certain alloy materials of the air hardening type in order to prevent surface checking or cracking adjacent to the flame or arc-gouged surface.

(g) *Welded branch connections (reproduces 127.4.8).* (1) Figure 127.4.8A, Figure 127.4.8B, and Figure 127.4.8C of ANSI–B31.1 show typical details of branch connections with and without added reinforcement. However, no attempt has been made to show all acceptable types

of construction and the fact that a certain type of construction is illustrated does not indicate that it is recommended over other types not illustrated. See also Figure 56.70–15(g) for additional pipe connections.

(2) Figure 127.4.8D of ANSI–B31.1 shows basic types of weld attachments used in the fabrication of branch connections. The location and minimum size of these attachment welds shall conform to the requirements of this paragraph. Weld sizes shall be calculated in accordance with 104.3.1 of ANSI–B31.1, but shall not be less than the sizes shown in Figure 127.4.8D and F of ANSI–B31.1.

(3) The notations and symbols used in this paragraph and in Figure 127.4.8D and F of ANSI–B31.1 are as follows:

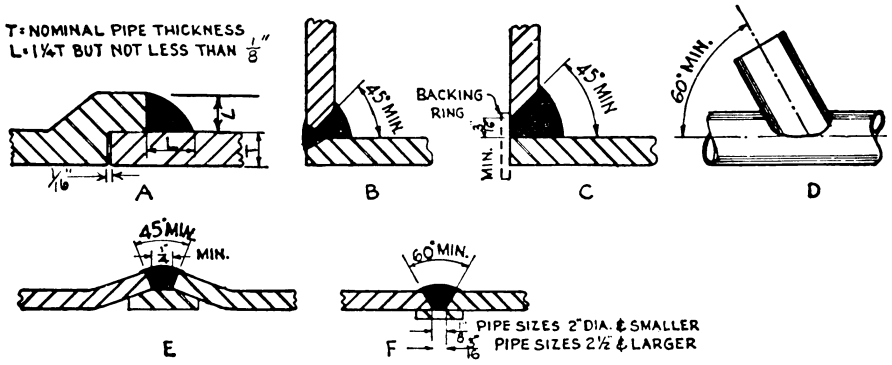

FIGURE 56.70–15(G)—ACCEPTABLE TYPES OF WELDED PIPE CONNECTIONS

t_n=nominal thickness of branch wall less corrosion allowance, inches.

t_c=the smaller of ¼ inch or $0.7t_n$.

t_e=nominal thickness of reinforcing element (ring or saddle), inches (t_e=0 if there is no added reinforcement).

t_{min}=the smaller of t_n or t_e.

t_w=dimension of partial penetration weld, inches.

(4) Branch connections (including specially made integrally reinforced branch connection fittings) which abut the outside surface of the run wall, or which are inserted through an opening cut in the run wall, shall have opening and branch contour to provide a good fit and shall be attached by means of full penetration groove welds except as otherwise permitted in paragraph (g)(7) of this section. The full penetration groove welds shall be finished with cover fillet welds having a minimum throat dimension not less than t_c. The limitation as to imperfection of these groove welds shall be as set forth in 127.4.2(e) of ANSI–B31.1 for girth welds.

(5) In branch connections having reinforcement pads or saddles, the reinforcement shall be attached by welds at the outer edge and at the branch periphery as follows:

(i) If the weld joining the added reinforcement to the branch is a full penetration groove weld, it shall be finished with a cover fillet weld having a minimum throat dimension not less than t_c the weld at the outer edge, joining the added reinforcement to the run, shall be a fillet weld with a minimum throat dimension of 0.5 t_e.

(ii) If the weld joining the added reinforcement to the branch is a fillet weld, the throat dimension shall not be less than 0.7 t_{min}. The weld at the outer edge joining the outer reinforcement to the run shall also be a fillet weld with a minimum throat dimension of 0.5 t_e.

(6) When rings or saddles are used, a vent hole shall be provided (at the side and not at the crotch) in the ring or

saddle to reveal leakage in the weld between branch and main run and to provide venting during welding and heat treating operations. Rings or saddles may be made in more than one piece if the joints between the pieces have strength equivalent to ring or saddle parent metal and if each piece is provided with a vent hole. A good fit shall be provided between reinforcing rings or saddles and the parts to which they are attached.

(7) Branch connections 2 in. NPS and smaller that do not require reinforcement may be constructed as shown in Fig. 127.4.8F of ANSI–B31.1. This construction is limited to use in Class I and II piping systems at a maximum design temperature of 750 °F. or a maximum pressure of 1025 psi.

(h) *Heat treatment.* Heat treatment for welds shall be in accordance with subpart 56.85.

TABLE 56.70–15—REINFORCEMENT OF GIRTH AND LONGITUDINAL BUTT WELDS

Thickness (in inches) of base metal	Maximum thickness (in inches) of reinforcement for design temperature		
	Below 0 °F or above 750 °F	350° to 750 °F	0 °F and above but less than 350 °F
Up to 1/8, inclusive	1/16	3/32	3/16
Over 1/8 to 3/16, inclusive	1/16	1/8	3/16
Over 3/16 to 1/2, inclusive	1/16	5/32	3/16
Over 1/2 to 1, inclusive	3/32	3/16	3/16
Over 1 to 2, inclusive	1/8	1/4	1/4
Over 2	5/32	(1)	(1)

[1] The greater of 1/4 in. or 1/8 times the width of the weld in inches.

NOTES: 1. For double welded butt joints, this limitation on reinforcement given above applies separately to both inside and outside surfaces of the joint.
2. For single welded butt joints, the reinforcement limits given above apply to the outside surface of the joint only.
3. The thickness of weld reinforcement is based on the thickness of the thinner of the materials being joined.
4. The weld reinforcement thicknesses must be determined for the higher of the abutting surfaces involved.
5. For boiler external piping use the column titled "Below 0 °F. or above 750 °F." for weld reinforcement thicknesses.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9978, June 17, 1970; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CGD 77–140, 54 FR 40614, Oct. 2, 1989; 55 FR 39969, Oct. 1, 1990; CGD 95–012, 60 FR 48050, Sept. 18, 1995]

§ 56.70–20 Qualification, general.

(a) Qualification of the welding procedures to be used, and of the performance of welders and welding operators, is required, and shall comply with the requirements of the ASME Boiler and Pressure Vessel Code (section IX) except as modified by part 57 of this subchapter.

(b) Each butt-welded joint of Class I of Class I–L piping shall be marked with the welder's identification symbol. Dies shall not be used to mark the pipe where the pressure exceeds 600 pounds per square inch or the temperature exceeds 750 °F. or in Class I–L systems.

Subpart 56.75—Brazing

§ 56.75–5 Filler metal.

(a) The filler metal used in brazing must be a nonferrous metal or alloy having a melting point above 1,000°F. and below that of the metal being joined. The filler metal must meet and flow freely within the desired temperature range and, in conjunction with a suitable flux or controlled atmosphere, must wet and adhere to the surfaces to be joined. Prior to using a particular brazing material in a piping system, the requirements of §56.60–20 of this part should be considered.

(b) The brazing material used shall have a shearing strength of at least 10,000 pounds per square inch. The maximum allowable working pressure for brazing piping shall be determined by this part.

(c) (Reproduces 128.1.2.) Fluxes that are fluid and chemically active at the brazing temperature shall be used when necessary to prevent oxidation of the filler metal and the surfaces to be

joined and to promote free flowing of the filler metal.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 77–140, 54 FR 40615, Oct. 2, 1989]

§ 56.75–10 Joint clearance (reproduces 128.2.2).

(a) The clearance between surfaces to be joined shall be no larger than is necessary to insure complete capillary distribution of the filler metal; between 0.002–inch minimum and 0.006-inch maximum.

(b) [Reserved]

§ 56.75–15 Heating (reproduces 128.2.3).

(a) The joint shall be brought to brazing temperature in as short a time as possible to minimize oxidation.

(b) [Reserved]

§ 56.75–20 Brazing qualification.

(a) The qualification of the performance of brazers and brazing operators, shall be in accordance with the requirements of part C, section IX of the ASME Code and part 57 of this subchapter.

(b) Manufacturers shall perform those tests required by paragraph (a) of this section prior to performing production brazing.

§ 56.75–25 Detail requirements.

(a) Pipe may be fabricated by brazing when the temperature to which such connections may be subjected does not exceed 425 °F. (For exception refer to § 56.30–30(b)(1).)

(b) *(Reproduces 128.2.1.)* The surfaces to be brazed shall be clean and free from grease, oxides, paint, scale, and dirt of any kind. Any suitable chemical or mechanical cleaning method may be used to provide a clean wettable surface for brazing.

(c) After the parts to be joined have been thoroughly cleaned the edges to be brazed shall be given an even coating of flux prior to heating the joint as a protection against oxidation.

§ 56.75–30 Pipe joining details.

(a) *Silver brazing.* (1) Circumferential pipe joints may be either of the socket or butt type. When butt joints are employed the edges to be joined shall be cut or machined square and the edges shall be held closely together to insure a satisfactory joint.

(b) *Copper-alloy brazing.* (1) Copper-alloy brazing may be employed to join pipe, valves, and fittings. Circumferential joints may be either of the butt or socket type. Where butt joints are employed, the included angle shall be not less than 90° where the wall thickness is three-sixteenths of an inch or greater. The annular clearance of socket joints shall be held to small clearances which experience indicates is satisfactory for the brazing alloy to be employed, method of heating, and material to be joined. The annular clearance shall be shown on drawings submitted for approval of socket joints.

(2) Copper pipe fabricated with longitudinal joints for pressures not exceeding that permitted by the regulations in this subchapter may have butt, lapped, or scarfed joints. If of the latter type, the kerf of the material shall be not less than 60°.

(c) *Brazing, general.* (1) Heat shall be applied evenly and uniformly to all parts of the joint in order to prevent local overheating.

(2) The members to be joined shall be held firmly in place until the brazing alloy has set so as to prevent any strain on the joint until the brazing alloy has thoroughly solidified. The brazing shall be done by placing the flux and brazing material on one side of the joint and applying heat until the brazing material flows entirely through the lap and shows uniformly along the seam on the other side of the joint. Sufficient flux shall be used to cause the brazing material to appear promptly after reaching the brazing temperature.

Subpart 56.80—Bending and Forming

§ 56.80–5 Bending.

Pipe may be bent by any hot or cold method and to any radius which will result in a bend surface free of cracks, as determined by a method of inspection specified in the design, and substantially free of buckles. Such bends shall meet the design requirements of 102.4.5 and 104.2.1 of ANSI–B31.1. This

shall not prohibit the use of bends designed as creased or corrugated. If doubt exists as to the wall thickness being adequate, Class I piping having diameters exceeding 4 inches shall be nondestructively examined by the use of ultrasonics or other acceptable method. Alternatively, the pipe may be drilled, gaged, and fitted with a screwed plug extending outside the pipe covering. The nondestructive method shall be employed where the design temperature exceeds 750 °F. Prior to the use of nondestructive method of examination by the above procedure, it shall be demonstrated by the user, in the presence of a marine inspector on specimens similar to those to be examined, that consistent results, having an accuracy of plus or minus 3 percent, can be obtained.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970]

§ 56.80–10 Forming (reproduces 129.2).

(a) Piping components may be formed (swaging, lapping, or upsetting of pipe ends, extrusion of necks, etc.) by any suitable hot or cold working method, providing such processes result in formed surfaces which are uniform and free of cracks or other defects, as determined by methods of inspection specified in the design.

§ 56.80–15 Heat treatment of bends and formed components.

(a) *(Reproduces 129.3.1.)* Carbon steel piping which has been heated to at least 1,650 °F. for bending or other forming operations shall require no subsequent heat treatment.

(b) Ferritic alloy steel piping which has been heated for bending or other forming operations shall receive a stress relieving treatment, a full anneal, or a normalize and temper treatment, as specified by the design specification before welding.

(c) *(Reproduces 129.3.3.)* Cold bending and forming of carbon steel having a wall thickness of three-fourths of an inch and heavier, and all ferritic alloy pipe in nominal pipe sizes of 4 inches and larger, or ½-inch wall thickness or heavier, shall require a stress relieving treatment.

(d) *(Reproduces 129.3.4.)* Cold bending of carbon and ferritic alloy steel pipe in sizes and wall thicknesses less than specified in 129.3.3 of ANSI–B31.1 may be used without a postheat treatment.

(e) *(Reproduces 129.3.5.)* For other materials the heat treatment of bends and formed components shall be such as to insure pipe properties that are consistent with the original pipe specification.

(f) All scale shall be removed from heat treated pipe prior to installation.

(g) *(Reproduces 129.3.6.)* Austenitic stainless steel pipe that has been heated for bending or other forming may be used in the "as-bent" condition unless the design specification requires post bending heat treatment.

[CGFR 68–62, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970; CGD 73–254, 40 FR 40166, Sept. 2, 1975]

Subpart 56.85—Heat Treatment of Welds

§ 56.85–5 Heating and cooling method (reproduces 131.1).

(a) Heat treatment may be accomplished by a suitable heating method which will provide the desired heating and cooling rates, the required metal temperature, metal temperature uniformity, and temperature control.

§ 56.85–10 Preheating.

(a) The minimum preheat temperatures listed in Table 56.85–10 for P-number materials groupings are mandatory minimum pre-heat temperatures. Preheat is required for Class I, I–L, I–N, II–N and II–L piping when the ambient temperature is below 50 °F.

(b) *(Modifies 131.2.2.)* When welding dissimilar materials the minimum preheat temperature may not be lower than the highest temperature listed in Table 56.85–10 for any of the materials to be welded or the temperature established in the qualified welding procedure.

(c) *(Reproduces 131.2.3.)* The preheat temperature shall be checked by use of temperature-indicating crayons, thermocouples, pyrometers, or other suitable methods to assure that the required preheat temperature is obtained prior to and uniformly maintained during the welding operation.

TABLE 56.85–10—PREHEAT AND POSTHEAT TREATMENT OF WELDS

ASME Sec IX Nos.	Preheat required			Post heat treatment requirement (1)(2)		
					Time cycle	
	Minimum wall (3)(4) (inch)	Minimum temperature (5)(6)(°F)	Minimum wall and other (3)(4)(17)(inch)	Temperature (7)(8)(9)(10)(11)(12)(°F)(inch)	Hour per inch of wall (3)(4)	Minimum time within range (hour)
P–1(16)	All	50 (for .30 C. maximum or less) (13).	Over ¾ in	1,100 to 1,200 (minimum) (maximum).	1	1
P–1(16)	All	175 (for over .30 C.) (13) and wall thickness over 1 in.	...do	...do	1	1
P–3(15)	All walls	175	Over ½ in	1,200 to 1,350 (minimum) (maximum).	1	1
P–4(15)	Up to ¾ in inclusive.	300	Over ½ in or over 4 in nom. size or.	1,330 to 1,400 (minimum) (maximum).	1	1
	Over ¾ in	400	Over .15 C. maximum.			
P–5(15) (less than 5 cr.).	Up to ¾ in inclusive.	300	Over ½ in or over 4 in. nom. size or.	1,300 to 1,425 (minimum) (maximum).	1	1
	Over ¾ in	400	Over 0.15 C. maximum.			
P–5(15) (5 cr. and higher).	Up to ¾ inclusive.	300	All walls	...do	1	2
	Over ¾ in	400	Over 0.15 C. maximum.			
P–6	All walls	300 (14).	All walls	1,400 to 1,500 (minimum) (maximum).	1	2
P–8	...do	None required	...do	None required.		

For P–7, P–9A, P–9B, P–10C and other materials not listed the Preheat and Postheat Treatment is to be in accordance with the qualified procedure.

Notes Applicable To Table 56.85–10:

(1) Not applicable to dissimilar metal welds.

(2) When postheat treatment by annealing or normalizing is used, the postheat treatment temperatures must be in accordance with the qualified welding procedure.

(3) Wall thickness of a butt weld is defined as the thicker of the two abutting ends after end preparation including I.D. machining.

(4) The thickness of socket, fillet, and seal welds is defined as the throat thicknesses for pressure and nonpressure retaining welds.

(5) Preheat temperatures must be checked by use of temperature indicating crayons, thermocouple pyrometers, or other suitable method.

(6) For inert gas tungsten arc root pass welding lower preheat in accordance with the qualified procedure may be used.

(7) The maximum postheat treatment temperature listed for each P number is a recommended maximum temperature.

(8) Postheat treatment temperatures must be checked by use of thermocouple pyrometers or other suitable means.

(9) Heating rate for furnace, gas, electric resistance, and other surface heating methods must not exceed: (i) 600 °F per hour for thicknesses 2 inches and under.

(ii) 600 °F per hour divided by ½ the thickness in inches for thickness over 2 inches.

(10) Heating route for induction heating must not exceed:

(i) 600 °F per hour for thickness less than 1½ inches (60 and 400 cycles).

(ii) 500 °F per hour when using 60 cycles and 400 °F per hour when using 400 cycles for thicknesses 1½ inches and over.

(11) When local heating is used, the weld must be allowed to cool slowly from the postheat treatment temperature. A suggested method of retarding cooling is to wrap the weld with asbestos and allow to cool in still air. When furnace cooling is used, the pipe sections must be cooled in the furnace to 1000 °F and may then be cooled further in still air.

(12) Local postheat treatment of butt welded joints must be performed on a circumferential band of the pipe. The minimum width of this band, centered on the weld, must be the width of the weld plus 2 inches.

Local postheat treatment of welded branch connections must be performed by heating a circumferential band of the pipe to which the branch is welded. The width of the heated

band must extend at least 1 inch beyond the weld joining the branch.

(13) 0.30 C. max applies to specified ladle analysis.

(14) 600 °F maximum interpass temperature.

(15) Welding on P–3, P–4, and P–5 with 3 Cr max. may be interrupted only if—

(i) At least ⅜ inch thickness of weld is deposited or 25 percent of welding groove is filled, whichever is greater;

(ii) The weld is allowed to cool slowly to room temperature; and

(iii) The required preheat is resumed before welding is continued.

(16) When attaching welding carbon steel non-pressure parts to steel pressure parts and the throat thickness of the fillet or partial or full penetration weld is ½ in. or less, postheat treatment of the fillet weld is not required for Class I and II piping if preheat to a minimum temperature of 175 °F is applied when the thickness of the pressure part exceeds ¾ in.

(17) For Class I–L and II–L piping systems, relief from postweld heat treatment may not be dependent upon wall thickness. See also §§ 56.50–105(a)(3) and 56.50–105(b)(3) of this chapter.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9980, June 17, 1970; CGD 72–104R, 37 FR 14234, July 18, 1972; CGD 72–206R, 38 FR 17229, June 29, 1973; CGD 73–254, 40 FR 40166, Sept. 2, 1975; CGD 77–140, 54 FR 40615, Oct. 2, 1989]

§ 56.85–15 Postheat treatment.

(a) Where pressure retaining components having different thicknesses are welded together as is often the case when making branch connections, the preheat and postheat treatment requirements of Table 56.85–10 apply to the thicker of the components being joined. Postweld heat treatment is required for Classes I, I–L, II–L, and systems. It is not required for Class II piping. Refer to § 56.50–105(a)(3) for exceptions in Classes I–L and II–L systems and to paragraph (b) of this section for Class I systems.

(b) All buttwelded joints in Class I piping shall be postweld heated as required by Table 56.85–10. The following exceptions are permitted:

(1) High pressure salt water piping systems used in tank cleaning operations; and,

(2) Gas supply piping of carbon or carbon molybdenum steel used in gas turbines.

(c) All complicated connections including manifolds shall be stress-relieved in a furnace as a whole as required by Table 56.85–10 before being taken aboard ship for installation.

(d) *(Reproduces 131.3.2.)* The postheat treatment method selected for parts of an assembly shall not adversely affect other components. Heating a fabricated assembly as a complete unit is usually desirable; however, the size or shape of the unit or the adverse effect of a desired heat treatment on one or more components where dissimilar materials are involved, may dictate alternative procedures such as heating a section of the assembly before the attachment of others, or local circumferential band heating of welded joints in accordance with § 56.85–15(j)(3) and note (12) of Table 56.85–10.

(e) *(Reproduces 131.3.3.)* Postheat treatment of welded joints between dissimilar metals having different postheat requirements shall be that established in the qualified welding procedure.

(f)–(h) [Reserved]

(i) *(Reproduces 131.3.4.)* For those materials listed under P–No. 1, when the wall thickness of the thicker of the two abutting ends, after end preparation, is less than three-fourths inch, the weld need not be postheat treated. In all cases, where the nominal wall thickness is ¾ in. or less, postheat treatment is not required.

(j) (1)–(2) [Reserved]

(3) In local postheat treatment the entire band must be brought up to uniform specified temperature over the complete circumference of the pipe section, with a gradual diminishing of the temperature outward from the edges of the band.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 72–206R, 38 FR 17229, June 29, 1973; CGD 73–254, 40 FR 40167, Sept. 2, 1975]

Subpart 56.90—Assembly

§ 56.90–1 General.

(a) The assembly of the various piping components, whether done in a shop or as field erection, shall be done so that the completely erected piping conforms with the requirements of the regulations in this subchapter and with the specified requirements of the engineering design.

§56.90–5 Bolting procedure.

(a) All flanged joints shall be fitted up so that the gasket contact faces bear uniformly on the gasket and then shall be made up with relatively uniform bolt stress. Bolt loading and gasket compression need only be verified by touch and visual observation.

(b) (Reproduces 135.2.2.) In bolting gasketed flanged joints, the gasket shall be properly compressed in accordance with the design principles applicable to the type of gasket used.

(c) Steel to cast iron flanged joints shall be assembled with care to prevent damage to the cast iron flange in accordance with §56.25–10.

(d) (Reproduces 135.2.4.) All bolts shall be engaged so that there is visible evidence of complete threading through the nut or threaded attachment.

§56.90–10 Threaded piping (reproduces 135.4).

(a) Any compound or lubricant used in threaded joints shall be suitable for the service conditions and shall not react unfavorably with either the service fluid or the piping materials.

(b) Threaded joints which are to be seal welded shall be made up without any thread compound.

(c) Backing off to permit alignment of pipe threaded joints shall not be permitted.

Subpart 56.95—Inspection

§56.95–1 General (replaces 136).

(a) The provisions in this subpart shall apply to inspection in lieu of 136 of ANSI–B31.1.

(b) Prior to initial operation, a piping installation shall be inspected to the extent necessary to assure compliance with the engineering design, and with the material, fabrication, assembly and test requirements of ANSI–B31.1, as modified by this subchapter. This inspection is the responsibility of the owner and may be performed by employees of the owner or of an engineering organization employed by the owner, together with the marine inspector.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970]

§56.95–5 Rights of access of marine inspectors.

Marine inspectors shall have rights of access to any place where work concerned with the piping is being performed. This includes manufacture, fabrication, assembly, erection, and testing of the piping or system components. Marine inspectors shall have access to review all certifications or records pertaining to the inspection requirements of §56.95–1, including certified qualifications for welders, welding operators, and welding procedures.

§56.95–10 Type and extent of examination required.

(a) *General.* The types and extent of nondestructive examinations required for piping must be in accordance with this section and Table 136.4 of ANSI–B31.1. In addition, a visual examination shall be made.

(1) 100 percent radiography[1] is required for all Class I, I–L, and II–L piping with wall thickness equal to or greater than 10 mm (.375 in.).

(2) Nondestructive examination is required for all Class II piping equal to or greater than 18 inches nominal diameter regardless of wall thickness. Any test method acceptable to the Officer in Charge, Marine Inspection may be used.

(3) Appropriate nondestructive examinations of other piping systems are required only when deemed necessary by the Officer in Charge, Marine Inspection. In such cases a method of testing satisfactory to the Officer in Charge, Marine Inspection must be selected from those described in this section.

(b) *Visual examination.* Visual examination consists of observation by the marine inspector of whatever portions of a component or weld are exposed to such observation, either before, during, or after manufacture, fabrication, assembly or test. All welds, pipe and piping components shall be capable of complying with the limitations on imperfections specified in the product

specification under which the pipe or component was purchased, or with the limitations on imperfections specified in § 56.70–15(b) (7) and (8), and (c), as applicable.

(c) *Nondestructive types of examinations*—(1) *100 Percent radiography.* Where 100 percent radiography [1] is required for welds in piping, each weld in the piping shall be completely radiographed. If a butt weld is examined by radiography, for either random or 100 percent radiography, the method used shall be as follows:

(i) X-ray or gamma ray method of radiography may be used. The selection of the method shall be dependent upon its adaptability to the work being radiographed. The procedure to be followed shall be as indicated in PW–51 of section I of the ASME Code.

(ii) If a piping component or a weld other than a butt weld is radiographed, the method used shall be in accordance with UW–51 of section VIII of the ASME Code.

(2) *Random radiography.* Where random radiography [1] is required, one or more welds may be completely or partially radiographed. Random radiography is considered to be a desirable means of spot checking welder performance, particularly in field welding where conditions such as position, ambient temperatures, and cleanliness are not as readily controlled as in shop welding. It is to be employed whenever an Officer in Charge, Marine Inspection questions a pipe weld not otherwise required to be tested. The standards of acceptance are the same as for 100 percent radiography.

(3) *Ultrasonic.* Where 100 percent ultrasonic testing is specified, the entire surface of the weld being inspected shall be covered using extreme care and careful methods to be sure that a true representation of the actual conditions is obtained. The procedures to be used shall be submitted to the Commandant for approval.

(4) *Liquid penetrant.* Where liquid penetrant examination is required, the entire surface of the weld being examined shall be covered. The examination shall be performed in accordance with appendix VIII to section VIII of the ASME Code. The following standards of acceptance shall be met:

(i) All linear discontinuities and aligned penetrant indications revealed by the test shall be removed. Aligned penetrant indications are those in which the average of the center-to-center distances between any one indication and the two adjacent indications in any straight line is less than three-sixteenths inch. All other discontinuities revealed on the surface need not be removed unless the discontinuities are also revealed by radiography, in which case the pertinent radiographic specification shall apply.

(5) *Magnetic particle.* Where magnetic particle testing is required, the entire surface of the weld being examined shall be covered. The testing shall be performed in accordance with appendix VI to section VIII of the ASME Code. The following standards of acceptance are required for welds. All linear discontinuities and aligned indications revealed by the test shall be removed. Aligned indications are those in which the average of the center-to-center distances between any one indication and the two adjacent indications in any straight line is less than three-sixteenths inch. All other revealed discontinuities need not be removed unless the discontinuities are also revealed by radiography, in which case the requirements of paragraph (c)(1) of this section shall be met.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 72–206R, 38 FR 17229, June 29, 1973; CGD 78–108, 43 FR 46546, Oct. 10, 1978; CGD 77–140, 54 FR 40615, Oct. 2, 1989; CGD 95–028, 62 FR 51202, Sept. 30, 1997; USCG–2000–7790, 65 FR 58460, Sept. 29, 2000]

Subpart 56.97—Pressure Tests

§ 56.97–1 General (replaces 137).

(a) *Scope.* The requirements in this subpart apply to pressure tests of piping in lieu of 137 of ANSI–B31.1. Those paragraphs reproduced are so noted.

(b) *Leak tightness.* It is mandatory that the design, fabrication and erection of piping constructed under the regulations in this subchapter demonstrate leak tightness. Except where otherwise permitted in this subpart,

[1] Where for some reason, such as joint configuration, radiography is not applicable, another approved examination may be utilized.

this requirement must be met by a hydrostatic leak test prior to initial operations. Where a hydrostatic test is not practicable, a pneumatic test (§56.97–35) or initial service leak test (§56.97–38) may be substituted if approved by the Commandant.

(1) At no time during the hydrostatic test may any part of the piping system be subjected to a stress greater than 90 percent of its yield strength (0.2 percent offset) at test temperature.

(2) Pneumatic tests may be used in lieu of the required hydrostatic test (except as permitted in paragraph (b)(3) of this section), only when—

(i) Piping subassemblies or systems are so designed or supported that they cannot be safely filled with water;[1] or

(ii) Piping subassemblies or systems are to be used in services where traces of the testing medium cannot be tolerated and, whenever possible, the piping subassemblies or system have been previously hydrostatically tested to the pressure required in §56.97–30(e).

(3) A pneumatic test at a pressure not to exceed 25 psig may be applied before a hydrostatic or a pneumatic test as a means of locating major leaks. The preliminary pneumatic test must be carried out in accordance with the requirements of §56.97–35.

NOTE: Compressed gas is hazardous when used as a testing medium. It is, therefore, recommended that special precautions for protection of personnel be taken whenever gas under pressure is used as the test medium.

(4) The hydrostatic test of the piping system, when conducted in accordance with the requirements of this part, is acceptable as the test for piping subassemblies and may also be used in lieu of any such test required by the material specification for material used in the piping subassembly or system provided the minimum test pressure required for the piping system is met, except where the installation would prevent performing any nondestructive examination required by the material specification to be performed subsequent to the hydrostatic or pneumatic test.

[1] These tests may be made with the item being tested partially filled with water, if desired.

[CGD 73–254, 40 FR 40167, Sept. 2, 1975]

§56.97–5 Pressure testing of nonstandard piping system components.

(a) All nonstandard piping system components such as welded valves and fittings, nonstandard fittings, manifolds, seacocks, and other appurtenances must be hydrostatically tested to twice the rated pressure stamped thereon, except that no component should be tested at a pressure causing stresses in excess of 90 percent of its yield strength.

(b) Items for which an accepted standard appears in Table 56.60–1(b) need not be tested as described in paragraph (a) of this section, but need only meet the test required in the applicable standard.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGD 77–140, 54 FR 40615, Oct. 2, 1989]

§56.97–25 Preparation for testing (reproduces 137.3).

(a) *Exposure of joints.* All joints including welds must be left uninsulated and exposed for examination during the test.

(b) *Addition of temporary supports.* Piping systems designed for vapor or gas may be provided with additional temporary supports, if necessary, to support the weight of the test liquid.

(c) *Restraint or isolation of expansion joints.* Expansion joints must be provided with temporary restraint, if required for the additional pressure load under test, or they must be isolated from the test.

(d) *Isolation of equipment not subjected to pressure test.* Equipment that is not to be subjected to the pressure test must be either disconnected from the piping subassembly or system or isolated by a blank flange or similar means. Valves may be used if the valve with its closure is suitable for the proposed test pressure.

(e) *Treatment of flanged joints containing blinds.* Flanged joints at which blinds are inserted to blank off other equipment during the test need not be tested.

(f) *Precautions against test medium expansion.* If a pressure test is to be maintained for a period of time and the test medium in the system is subject to thermal expansion, precautions must be taken to avoid excessive pressure. A small relief valve set to 1⅓ times the test pressure is recommended during the pressure test.

[CGD 73–254, 40 FR 40167, Sept. 2, 1975]

§ 56.97–30 Hydrostatic tests (reproduces 137.4).

(a) *Provision of air vents at high points.* Vents must be provided at all high points of the piping subassembly or system in the position in which the test is to be conducted to purge air pockets while the component or system is filling.

(b) *Test medium and test temperature.* (1) Water will be used for a hydrostatic leak test unless another medium is approved by the Commandant.

(2) The temperature of the test medium will be that of the available source unless otherwise approved by the Commandant upon review of the metallurgical aspects of the piping materials with respect to its brittle fracture properties.

(c) *Check of test equipment before applying pressure.* The test equipment must be examined before pressure is applied to ensure that it is tight and that all low-pressure filling lines and other items that should not be subjected to the test pressure have been disconnected or isolated by valves or other suitable means.

(d) *Examination for leakage after application of pressure.* Following the application of the hydrostatic test pressure for a minimum of 10 minutes (see § 56.97–30(g)), examination for leakage must be made of all joints, connections and of all regions of high stress, such as regions around openings and thickness-transition sections.

(e) *Minimum required hydrostatic test pressure.* Except as otherwise permitted in § 56.97–30(f) or § 56.97–40, piping systems must be subjected to a hydrostatic test pressure that at every point in the system is not less than 1.5 times the maximum allowable working pressure.

(f) *Maximum permissible hydrostatic test pressure.* (1) When a system is tested hydrostatically, the test pressure must not exceed the maximum test pressure of any component such as vessels, pumps, or valves in the system.

(2) At no time during the hydrostatic test may any part of the piping system be subjected to a stress greater than 90 percent of its yield strength (0.2 percent offset) at test temperature.

(g) *Hydrostatic test pressure holding time.* The hydrostatic test pressure must be maintained for a minimum total time of 10 minutes and for such additional time as may be necessary to conduct the examination for leakage required by § 56.97–30(d).

[CGD 73–254, 40 FR 40167, Sept. 2, 1975]

§ 56.97–35 Pneumatic tests (replaces 137.5).

(a) *General Requirements.* When a pneumatic test is performed, it must be conducted in accordance with the requirements of this section.

(b) *Test medium and test temperature.* (1) The gas used as the test medium must not be flammable.

(2) The temperature of the test medium will be that of the available source unless otherwise approved by the Commandant upon review of the metallurgical aspects of the piping materials with respect to its brittle fracture properties.

(c) *Check of test equipment before applying pressure.* The test equipment must be examined before pressure is applied to ensure that it is tight and that all items that should not be subjected to the test pressure have been disconnected or isolated by valves or other suitable means.

(d) *Procedure for applying pressure.* The pressure in the system must gradually be increased to not more than one-half of the test pressure, after which the pressure is increased in steps of approximately one-tenth of the test pressure until the required test pressure has been reached.

(e) *Examination for leakage after application of pressure.* Following the application of pressure for the time specified in § 56.97–35(h), examination for leakage in accordance with 56.97–30(d) must be conducted.

(f) *Minimum required pneumatic test pressure.* Except as provided in § 56.97–35(g) or § 56.97–40, the pneumatic test

pressure may not be less than 1.20 nor more than 1.25 times the maximum allowable working pressure of the piping subassembly system.

(g) *Maximum permissible pneumatic test pressure.* When a system is tested pneumatically, the test pressure may not exceed the maximum test pressure of any component such as vessels, pumps or valves in the system.

(h) *Pneumatic test pressure holding time.* The pneumatic test pressure must be maintained for a minimum total time of 10 minutes and for such additional time as may be necessary to conduct the examination for leakage required in §56.97–30(d).

[CGD 73–254, 40 FR 40168, Sept. 2, 1975]

§56.97–38 Initial service leak test (reproduces 137.7).

(a) An initial service leak test and inspection is acceptable when other types of test are not practical or when leak tightness is conveniently demonstrable due to the nature of the service. One example is turbine extraction piping where shut-off valves are not available for isolating a line and where temporary closures are impractical. Others may be systems for service water, low pressure condensate, plant and instrument air, etc., where checking out of pumps and compressors afford ample opportunity for leak tightness inspection prior to fullscale operation.

(b) The piping system must be gradually brought up to design pressure. After inspection of the piping system has proven that the installation is complete and all joints are leak-tight, the piping has met the requirements of §56.97–1.

[CGD 73–254, 40 FR 40168, Sept. 2, 1975]

§56.97–40 Installation tests.

(a) The following piping systems shall be hydrostatically leak tested in the presence of a marine inspector at a pressure of 1½ times the maximum allowable working pressure of the system:

(1) Class I steam, feedwater, and blowoff piping. Where piping is attached to boilers by welding without practical means of blanking off for testing, the piping shall be subjected to the same hydrostatic pressure to which the boiler is tested. The maximum allowable working pressures of boiler feedwater and blowoff piping shall be the design pressures specified in §§56.50–30(a)(3) and 56.50–40(b), respectively.

(2) Fuel oil discharge piping between the pumps and the burners, but not less than 500 pounds per square inch.

(3) High-pressure piping for tank cleaning operations.

(4) Flammable or corrosive liquids and compressed gas cargo piping, but not less than 150 pounds per square inch.

(5) Any Class I, I–L, II–L piping.

(6) Cargo oil piping.

(7) Firemains, but not less than 150 pounds per square inch.

(8) Fuel oil transfer and filling piping.

(9) Class I compressed air piping.

(10) Fixed oxygen-acetylene system piping.

(b) Installation testing requirements for refrigeration, fluid power, and liquefied petroleum gas cooking and heating systems may be found in part 58 of this subchapter.

(c) Class II piping systems shall be tested under working conditions as specified in the section on initial service leak test, §56.97–38.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9980, June 17, 1970; CGD 72–206R, 38 FR 17229, June 29, 1973 CGD 73–254, 40 FR 40168, Sept. 2, 1975; CGD 95–028, 62 FR 51202, Sept. 30, 1997]

PART 57—WELDING AND BRAZING

Subpart 57.01—Scope

Sec.

Subpart 57.02—General Requirements

Subpart 57.03—Procedure Qualifications